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2016 SAEM ABSTRACTS

This year, the Program Committee has chosen 670 scientific abstracts and 49 innovations presentations as the heart of the Society for Academic Emergency Medicine's Annual Meeting. I congratulate the committee on balancing the peer review process on a thin ledge between leniency and exclusiveness. The peer review remains our best, albeit flawed method to select the highest quality work. Peer review remains part scientific method and part beauty contest.

Emergent themes include health services studies, the emergency department as a platform for public health, and management of high risk, but low probability symptoms. These themes shape thinking, policy and the use of resources. The body of work manifests a keen understanding of emergency care practice, and solutions to problems observed on shift. An honest analysis will reveal a plurality of descriptive, hypothesis-generating abstracts and many incremental or derivative studies. Perhaps future meetings will bring more clinical trials to test novel treatments and interventions, and clinical experiments designed to give solid answers to hypotheses honed over years of inquiry. But that requires scholarly maturation, a process in progress for our 30 year old specialty.

Besides the science, please enjoy the growing diversity of this meeting in terms of didactic sessions for learners of all levels, the competition, the collaboration and the comradery that you can build here. And speaking of diversity, what better location than the French Quarter of New Orleans for emergency care providers, who open their hearts and minds to all people, all the time? Like the emergency department, this city offers a farraginous assortment of surprise, satisfaction, and illogic, which taken together, make a good story. Aren't we all for a good story to tell?

Jeffrey L. Kline MD
Editor-in-Chief

The following standard acronyms are used in the abstracts:

95% CI	95% confidence interval
AAAEM	Academy of Administrators in Academic Emergency Medicine
AAEM	American Academy of Emergency Medicine
ACEP	American College of Emergency Physicians
ACGME	Accreditation Council for Graduate Medical Education
ADIEM	Academy for Diversity & Inclusion in Emergency Medicine
AEUS	Academy of Emergency Ultrasound
AGEM	Academy of Geriatric Emergency Medicine
AIDS	acquired immune deficiency syndrome
ASA	aspirin
AUC	area under the curve
AWAEM	Academy for Women in Academic Emergency Medicine
BP	blood pressure
bpm	beats per minute
CBC	complete blood count
CDEM	Clerkship Directors in Emergency Medicine
CORD	Council of Emergency Medicine Residency Directors
CPR	cardiopulmonary resuscitation
CT	computed tomography
CXR	chest x-ray
CVA	cerebrovascular accident
dBP	diastolic blood pressure
ECG	electrocardiogram
ED	emergency department
EM	emergency medicine
EMS	emergency medical services
FDA	US Food and Drug Administration
GEMA	Global Emergency Medicine Academy
HIV	human immunodeficiency virus
INR	International Normalized Ratio
IQR	inter-quartile range
IV	intravenous

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mmHg	millimeters of mercury
MRI	magnetic resonance imaging
NIH	National Institutes of Health
PGY	post-graduate year
ROC	receiver operating characteristics
SAEM	Society for Academic Emergency Medicine
sBP	systolic blood pressure
SIM	Simulation Academy
SD	standard deviation
tPA	tissue plasminogen activator
U/S	ultrasound

1 Opioid Management Policies in New England Emergency Departments, 2014

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Background: Opioid-related morbidity and mortality has reached epidemic proportions in the U.S. In New England (NE), mortality is disproportionately high and states are struggling to address the issue. To date, however, little is known about current opioid management policies within NE EDs.

Objectives: Identify current opioid management policies in NE EDs.

Methods: We mailed surveys to ED directors in all 6 NE states (CT, MA, ME, NH, RI, VT) to assess their ED characteristics, capabilities, and policies in 2014. Using the National Emergency Department Inventory, we identified 195 hospital-affiliated EDs that were open to the public 24/7 (excluding federal and specialty hospitals). This analysis focused on questions asking about ED policies that promote: using a specific opioid abuse screening tool, accessing state Prescription Drug Monitoring Programs (PDMPs), notifying primary care physicians (PCPs) of opioid prescriptions, prescribing/dispensing naloxone, and referring patients to opioid abuse recovery resources. Data analysis included descriptive statistics, and comparisons of state differences using chi-square and Fisher's exact tests, as appropriate, were performed.

Results: A total of 168/195 (86%) NE EDs completed the survey; all state response rates were >80%. Overall, 148 (88%) NE EDs had any opioid management policy (Figure). The most commonly implemented policies were accessing state PDMPs before writing opioid prescriptions (78%) and referring patients with opioid abuse to recovery resources (70%). All 10 (100%) responding Rhode Island EDs had both of these policies. The other three opioid policies assessed by our survey were reported less frequently (<50%). The least commonly used policy was the promotion of prescribing/dispensing naloxone (12%): no Maine or New Hampshire EDs reported naloxone policies, although Rhode Island was an exception, where 6 (60%) EDs promoted treatment with naloxone (P<0.001).

Conclusion: In 2014, most NE EDs had opioid management policies, most commonly accessing PDMPs and referring patients with opioid abuse to recovery resources, but the presence of other specific components was variable. More work is needed to encourage targeted screening, prescribing/dispensing naloxone, and notifying PCPs of opioid prescriptions.

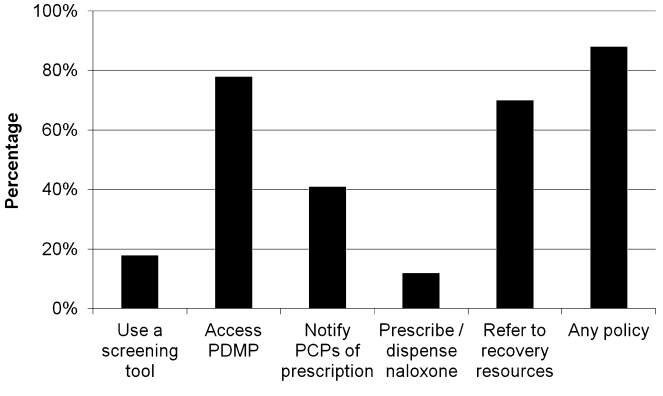

Figure 1 – Weiner

2 The Safe and Effective Implementation of Telestroke in a U.S. Community Hospital Setting

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Background: Tissue plasminogen activator (tPA) is underutilized for the treatment of acute ischemic stroke, and there is significant hospital-level variation in its use. Telestroke is a useful tool to bring neurological expertise to hospitals with fewer resources.

Objectives: To determine whether implementation of a telestroke intervention in a large integrated health system would lead to increased rates of tPA utilization for ischemic stroke patients. Secondarily, we examined whether rates of hemorrhagic complications changed with implementation.

Methods: This was a stepped-wedge cluster randomized trial in which ten community hospitals were connected to two tertiary care centers via telestroke. The intervention was implemented at each hospital incrementally over a 1-year period. We examined pre- and post-implementation data from July 2013 through January 2015. A two-level mixed effects logistic regression model was used to account for the staggered rollout. Primary outcome was tPA receipt; secondary outcome was rate of significant hemorrhagic complication.

Results: Of the 2,657 patients, demographic and clinical characteristics were similar between the pre- and post-intervention cohorts. Telestroke was engaged in 24% of post-intervention encounters. Utilization of tPA increased from 6.3% in the pre-intervention group to 10.9% in the post-intervention period, with no significant change in rates of complications. In regression analysis, post-intervention patients were more likely to receive tPA than pre-intervention patients (OR 2.0, 95% CI 1.2-3.4). Prior to implementation, 8 of the 10 community hospitals were significantly less likely to administer tPA than the highest-volume tertiary care center, however after implementation, 9 of the 10 were at least as likely to administer tPA as the highest-volume stroke center.

Conclusion: Implementation of a telestroke intervention in a regional integrated health system was safe and effective. Community hospitals' rates of tPA utilization quickly increased and were similar to the largest volume tertiary care center.

3 A Double Blind Multi-Arm Randomized Trial for Efficacy of Intramuscular Diclofenac Versus Intravenous Morphine Versus Intravenous Paracetamol, in Renal Colic Emergency Department Pain Management

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Background: Renal colic is one of the worst pains that a patient can experience, and results in more than one million emergency department (ED) visits per year in the USA. Rapid administration of effective analgesia is a priority in this setting. The choice of analgesia is not only determined by the evidence of effectiveness but also by the logistics involved in rapid administration.

Objectives: The aim of this study was to develop definitive evidence regarding the choice of initial analgesia and route of administration among patients presenting with renal colic to the ED.

Methods: In this three-treatment arm, double blinded, placebo-controlled trial, ED patients with moderate to severe renal colic (Numeric Rating Scale-NRS ≥ 4) were randomly assigned in a 1:1:1 ratio to receive diclofenac (75 mg/3 ml IM) or morphine (0.1 mg/kg IV) or paracetamol (1 gm/100 ml IV). Allocation was based on computer generated concealed block randomization. The primary outcome was the proportion of patients achieving ≥ 50% reduction in initial pain score at 30 minutes post analgesia.

Results: A total of 1645 patients were enrolled in the study. The primary outcome was achieved in 69.2% (95% CI: 64.6% to 73.5%) of patients in the diclofenac group, 67.8% (95% CI: 63.2% to 72.2%) in the paracetamol group, and 60.0% (95% CI: 55.3% to 64.6%) in the morphine group. Differences in proportions were statistically significant among the three groups using per protocol analysis (PPA)- among patients with diagnosed ureteric calculi (p=0.009) as well as intention to treat analysis (p=0.041). Rescue analgesia was administered to 12.4% of patients in the diclofenac group, significantly lower than in the morphine (24.3%; p<0.001) and paracetamol groups (21.7%; p<0.001). At two weeks follow-up, there were no reported episodes of dialysis or death, need for hospital admission for gastrointestinal bleeding or incidence of intramuscular complications at the injection, in any of the study groups.

Conclusion: Intramuscular diclofenac can be safely used as first line treatment and offers the fastest, most effective, and sustained relief from renal colic. (Funded by Hamad Medical Corporation Medical Research Center, Doha, Qatar; Clinicaltrials.gov. No. NCT02187614)

4 Going the Extra Mile: Predictors of Higher Milestone Achievement in Emergency Medicine Using Longitudinal Multicenter Direct Observation Data

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Background: The ACGME milestone project provides a standardized, longitudinal, and comprehensive framework for resident assessment. This system allows for analysis of resident performance across all years and programs at a scope and level of detail never previously possible. Very few studies have examined the role of gender in the evaluation in residents, and to our knowledge, this effect has never been studied in EM.

Objectives: The objective of this study was to determine the effects of evaluator and evaluatee gender on the evaluation of EM residents throughout residency training, across multiple training programs.

Methods: We examined 34,758 direct-observation sub-competency evaluations of 359 EM residents by 286 faculty at 8 EDs. Data were collected from July 2013 to July 2015 using a single digital evaluation tool. A mixed effects ordinal logistic regression was used to model the data and account for confounding variables.

Results: Significant predictors of milestone score included resident gender, resident experience, EM program, and the sub-competency evaluated (p<0.001 for each). Resident experience was a very strong predictor of score (p<0.001), which supports the validity of milestone evaluations. Scores varied significantly among the eight departments (p<0.001), which may indicate a difference in resident quality among sites, or may indicate poor reliability of milestone evaluation system. Female residents were evaluated higher than their male counterparts for the first 18 months of residency (p=0.004). However, the rate of milestone attainment was higher for male residents throughout the entire 3-year residency (p<0.001), which lead to a higher milestone score for men during the second year of residency that continued until graduation (see Figure). No overall differences in milestone scores were found based on evaluator gender (p=0.7) or the gender pairings of evaluator and evaluatee (p=0.4; see Table).

Conclusion: In our model resident experience, training program, and resident gender appear to play significant roles in the evaluation of EM residents. However, neither evaluator gender, nor gender pairings between the evaluator and evaluatee is a significant predictor of score. Further investigation will include analysis of the specific factors that may be driving these outcomes.

Dayal - Table of Factors

Factor	Estimated Effect on Score (model coefficient)	*p*-value
Resident Experience (per year)	1.4	<0.001
Male vs. Female Resident Milestone Attainment Rate	0.3	<0.001
Male Resident	−0.4	0.004
Procedural Task	−0.2	0.02
Resident and Attending Gender Interaction	−0.05	0.4
Male Attending	−0.01	0.7
Community Residency Program	0	1

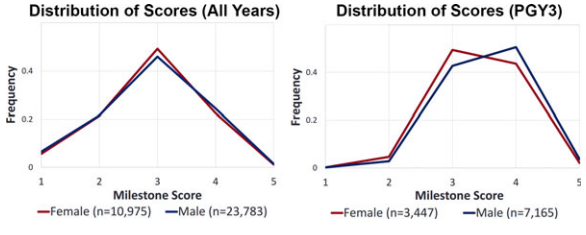

Figure 4 – Dayal

5 Youth Violence Prevention: Effects of a Universal Violence Intervention in an Urban ED

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Background: Violence is the leading cause of death among urban youth. ED visits represent an opportunity to deliver a brief intervention (BI) to reduce violence among at-risk youth.

Objectives: To determine the efficacy of a universally applied BI addressing violence behaviors among youth presenting to an ED in a high-risk community.

Methods: ED youth (14-20) seeking medical or injury related care in a Level 1 ED (10/2011-3/2015) and screening positive for a home address within the intervention or comparison neighborhood of a larger youth violence project were enrolled in the quasi-experimental study. Participants were assigned, based on home address, to receive either the 35-min therapist-delivered BI, or an informational brochure (enhanced control). The BI combined motivational interviewing and skills training, including a review of participant goals, tailored feedback, decisional balance exercises, role-playing, and community referrals. Participants completed baseline and 2-month follow-up assessments. Poisson and Zero-inflated Poisson regression examined efficacy of the BI on self-reported violence outcomes, including victimization, aggression, and self-efficacy for non-fighting.

Results: 409 youth (82% participation) were enrolled and assigned to either the BI (n=263) or control (n=146). 2-month follow-up was 91% (n=373). There were no significant baseline differences between the two study conditions. Among the full sample (n=409), mean age was 17.7 years (SD 1.9), 60% were male, 93% African-American, and 79% reported receipt of public assistance. Of participants, 9% were presenting for a violent injury, 9% reported recent firearm carriage, and 20% recent alcohol use. Compared with controls, participants in the therapist BI showed self-reported reductions in frequency of violent aggression (therapist BI, -45.1%; control, -33.3%; Incident rate ratio [IRR], 0.84; 95% confidence interval [CI], [0.74-0.96]) and increased self-efficacy for non-fighting (therapist BI, +7.2%; control, -1.3%; IRR, 1.09; 95% CI, 1.02-1.15). No changes were noted for victimization.

Conclusion: Among ED youth from high-risk communities, a brief, universally applied BI increased self-efficacy for avoiding fighting and decreased the frequency of violent aggression.

6 A Novel ED-based Critical Care Unit Reduces ICU Utilization

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Background: In the United States, ICU admission occurs in 1.5% of ED visits and 12.9% of ED hospital admissions. This results in 2.1 million annual ICU admissions from the ED. In Feb 2015 we opened the 9-bed Massey Emergency Critical Care Center (EC3) in our University Hospital ED. This unit is designed, equipped and staffed to provide early, time-dependent critical care for ED patients for up to 24 hours.

Objectives: In this study we examined the impact of deploying an ED-based ICU on inpatient ICU utilization.

Methods: University of Michigan is a tertiary care, academic medical center with over 75,000 annual adult visits. Data was abstracted from a monthly EC3 operational summary that includes aggregate de-identified data from the EMR and revenue cycle. Data from Feb 16, 2015 (EC3 opened) through Sept 30, 2015 was compared to the same time period in 2014. Comparative analysis included volume of patients, ICU admissions, ICU bed days, and transfer to ICU from non-ICU within 24 hours of admission.

Results: During the study period, 1,579 patients were treated in the EC3 and the median length of stay was 10 hours. Relative to the prior year, the total number of ED patient visits increased by 1,882 (4.1%) and overall hospital admissions increased by 1,152 (1.2%), but the number of ICU admissions decreased by 149 (13.1%). Deployment of the EC3 was associated with significant reductions in ICU admissions per ED visit from 2.5% [95% CI 2.4-2.6%] to 2.1% [95% CI 2.0-2.2%] and in ICU admissions per hospital admission from 7.2% [95% CI 6.8-7.6%] to 5.9% [95% Ci 5.6-6.3%]. This translates to 4 [95% CI 2-6] less ICU admissions per 1000 ED visits and 13 [95% CI 8-19] less ICU admissions per 1000 hospital admissions. Accounting for ICU median length of stay of 2.6 days, this created a surplus of 1,186 ICU bed days during the study period. Extrapolated over a year, a potential savings of 730 ICU admissions and 1,897 bed days would be realized. Additionally, the rate of non-ICU to ICU in-patient transfer < 24 hrs after ED admission has not changed, reflecting that this reduction in ICU admissions is not associated with increased patient decompensation within the first 24 hours.

Conclusion: An ED-based critical care unit safely reduces ICU utilization in a large academic medical center. Ongoing research is needed to quantify the impact on patient outcomes.

7 A Randomized, Double-Blind Trial Comparing Three Doses of Intravenous Ketorolac for Pain Management in the Emergency Department

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Background: Ketorolac tromethamine is a non-steroidal anti-inflammatory drug (NSAID) that is widely used in the emergency department (ED) for the treatment of moderate to severe pain. Ketorolac exhibits an analgesic ceiling effect at a dose of 10mg, however its FDA-recommended doses are 30mg intravenous and 60mg intramuscular injection.

Objectives: To assess the analgesic efficacy and side effect profile of three doses of intravenous ketorolac (10mg, 15mg, and 30mg) in ED patients with moderate to severe acute pain.

Methods: This prospective, randomized, double-blind trial evaluated patients aged 18-65 presenting to the ED with moderate to severe acute abdominal, flank, or musculoskeletal pain, defined as a Numeric Rating Scale (NRS) score ≥ 5. Enrolled patients were randomized to receive either 10mg (group1), 15mg (group2), or 30mg (group 3) of ketorolac.

	Group1 (10mg) N=71	Group2 (15mg) N=75	Group3 (30mg) N=73	P-Value
Median Age (range)	40 (22-64)	40 (18-64)	39 (18-65)	.848
% Female	51%	60%	55%	.526
Median Pain Score @ Baseline	8 (5-10)	7 (5-10)	8 (5-10)	.622
Median Pain Score @ 15 minutes	6 (0-10)	6 (0-10)	7 (0-10)	.126
Median Pain Score @ 30 minutes	5 (0-10)	5 (0-10)	5 (0-10)	.807
Median Pain Score @ 60 minutes	5 (0-10)	4 (0-9)	4 (0-10)	.321
Median Pain Score @ 90 minutes	4 (0-10)	4 (0-10)	3 (0-10)	.684
Median Pain Score @ 120 minutes	4 (0-9)	4 (0-8)	3 (0-9)	.420

Table 7: Motov.

Pain scores were recorded on a standard NRS ranging from 0 (no pain) to 10 (severe pain) at baseline, 15, 30, 60, 90 and 120 minutes. Data analyses included chi-square test and non-parametric test comparing medians. Power analysis indicated total enrollment of 240 patients.

Results: To date, 219 patients have enrolled in the study, with an expected enrollment of 240 by December, 2015. There were no significant differences in baseline characteristics. Pain scores decreased over time without statistically significant differences between the groups. No significant or clinically concerning changes in vital signs were noted. There were no serious adverse events. The most common side effects reported in a minority of patients in all three groups were dizziness, nausea, and headache.

Conclusion: When administered for acute pain the ED, ketorolac has similar analgesic efficacy and side effect profiles at intravenous doses of 10mg, 15mg, and 30mg.

8 Phase 3, Randomized, Double-Blind, Placebo-Controlled, Multicenter Clinical Study Evaluating the Safety and Efficacy of Icatibant for Angiotensin-Converting Enzyme Inhibitor-Induced Angioedema in Adults

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Background: Upper aerodigestive tract angioedema is a rare, life-threatening complication of angiotensin-converting enzyme inhibitor (ACE-I) therapy with no accepted pharmacologic treatment. Icatibant, a bradykinin B2 receptor antagonist effective for hereditary angioedema, was recently shown to decrease ACE-I-induced angioedema in a phase 2 study.

Objectives: To compare the efficacy and safety of icatibant with placebo in emergency patients with ACE-I-induced angioedema.

Methods: This was a phase 3 randomized (1:1) double-blind trial of icatibant 30 mg vs placebo, as a single subcutaneous injection, in adults presenting with at least moderately severe angioedema of <12 hours duration (ClinicalTrials.gov NCT01919801). We excluded patients not on an ACE-I or with prior angioedema while not on an ACE-I or with imminent intubation, urticaria or a family history of angioedema. The primary efficacy endpoint was Time to Meeting Discharge Criteria (TMDC) from study drug administration, based on a validated 4-component clinical score, assessed at least hourly by a physician, improving such that difficulty breathing and difficulty swallowing were deemed absent (severity=0 on a 0-4 scale) and voice change and tongue swelling were deemed mild/absent (0/1). The primary efficacy endpoint was tested using a two-sided Peto-Prentice test adjusted for race and baseline attack severity and summarized using Kaplan-Meier curves. The estimated sample size to identify a difference similar to the prior phase 2 study was 118 patients (α=0.05, power ≥95%, assuming 15% of subjects unevaluable).

Results: 121 patients were randomized at 31 sites (Table 1). The median TMDC was 4.0 hours in both groups (Figure 1; p=0.6) with no difference on planned subgroup analyses (by age, sex, race, attack severity, geographic region, weight or body mass index). Of 118 treated patients, 65% of icatibant vs 31% of placebo patients had injection site reactions, none of which were severe. 45% of icatibant- vs 36% of placebo-treated patients had other, general adverse events, mostly mild/moderate (no deaths or treatment-related serious events). Headache was reported in 12% of icatibant vs 7% of placebo patients and angioedema in 12% with icatibant vs 3% with placebo.

Conclusion: Icatibant offered no apparent benefit over placebo in the treatment of ACE-I-induced angioedema. No new safety signals were found.

Table 1.
Sinert: Demographics and Baseline Characteristics

	Icatibant 30 mg (N=61)	Placebo (N=60)
Mean age, years (SD)	61 (12)	62 (13)
Male, %	56	42
Black or African American, %	67	72
≥1 severe/very severe airway symptom, %	26	30
Received antihistamines prior to icatibant or placebo, %	85	88
Received corticosteroids prior to icatibant or placebo, %	80	85
Received epinephrine prior to icatibant or placebo, %	16	12
Hours between angioedema onset and icatibant/placebo administration, median (range)	7.9 (2.0, 12.4)	7.8 (1.7, 12.2)
Hours between receiving standard therapy and icatibant/placebo administration, median (range)	3.7 (0.8, 10.2)	3.1 (0.3, 10.3)

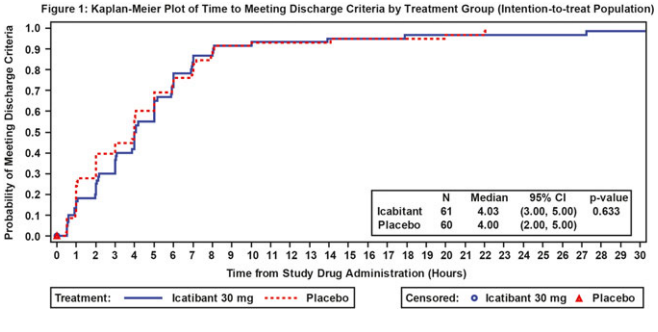

Figure 8 – Sinert

9 Incidence, Management and Outcomes of Laryngospasm in Children Undergoing Procedural Sedation in the Emergency Department

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Background: Laryngospasm (LS) is an uncommon acute airway event where: the vocal cords contract, making air exchange difficult. Ketamine is the most frequently used medication for procedural sedations in children and has the highest incidence of LS.

Objectives: To describe the reported incidence, management and outcomes of children having laryngospasm during procedural sedation in the Emergency Department (ED).

Methods: A systematic review and meta-analysis of children <18 years of age, undergoing procedural sedation in the ED was performed. Seven electronic databases were search. Randomized controlled trials and observational studies within the past 10 years were included. Two independent reviewers extracted the data. Meta-analysis was performed using a random-effects model and reported as incidence rate and 95% confidence intervals (CI).

Results: A total of 1,177 studies were retrieved for title and abstract screening, 258 underwent full text review. Forty-two studies reporting on 13,975 procedural sedations in 13,968 children were included. A total of 8,687 sedations reported the outcome of laryngospasm. Laryngospasm occurred in 34 patients (2.9 per 1,000 sedations; 95% CI, 1.1 to 4.7). Thirty-three of the 34 laryngospasms occurred in patients that received ketamine. Ketamine with propofol had the highest incidence at 4.6 per 1,000, followed by ketamine alone at 4.2 per 1,000 sedations among the articles that reported details on the management of laryngospasm, bag-valve mask ventilation was performed in 47% (8/17), airway repositioning with supplemental oxygen in 24% (4/17), supplemental oxygen alone 24% (4/17), intubation in 5% (1/17). The duration of the laryngospasm was brief (<1 minute) in 54% (7/13), 1 to 5 minutes in 31% (4/13), 6 to 10 minutes in 8% (1/13), and greater than 10 minutes in 8% (1/13). All cases resolved without serious sequela. There were no deaths reported.

Conclusion: The incidence of laryngospasm is 3 per 1,000 sedations. In most cases laryngospasm is brief in nature and can be managed with bag-mask ventilation. Training in basic and advance airway skills are needed to safely perform procedural sedation in the ED.

10 Esophageal Intubation as an Adjunct to Direct Laryngoscopy in Upper Gastrointestinal Bleeding: Description of a Novel Technique

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Background: Despite suction, patients with upper GI bleeds leave providers with a poor view of the vocal cords and render them blind during endotracheal intubation. Although anecdotal data suggests that in this patient population an ET tube placed in the esophagus may facilitate placement in the trachea[1], no study assessing the utility of this technique exists.

Objectives: To determine the utility of esophageal intubation in facilitating tracheal ET tube placement in patients with upper GI bleeds.

Methods: We included the use of a fresh cadaver with an unknown cause of death. The cadaver was prepared by creating a path into the mid to distal esophagus to facilitate the gravity assisted proximal flow of dark red dye simulating an upper GI bleed. Three intubation attempts were made; the first by DL and second by fiberoptic camera. The third attempt first involved purposeful esophageal intubation with cuff inflation, then DL and tracheal intubation with a second ET tube. In all attempts, tracheal insertion was only to occur if a clear view of the vocal cord was obtained. Tracheal placement was confirmed with a fiberoptic camera.

Results: Tracheal intubation was unsuccessful in the first and second attempts when DL and fiber optic camera were used alone. The third attempt at DL and endotracheal intubation was successful only after initial purposeful esophageal intubation with the ET tube.

Conclusion: Current teaching is to immediately remove an esophageal placed ET tube. However, we show that an ET tube placed in the esophagus proves beneficial, especially in the setting of an upper GI bleed. This prototype study serves as a building block for future studies that will be timed, and include multiple cadavers and operators at varied levels of training.

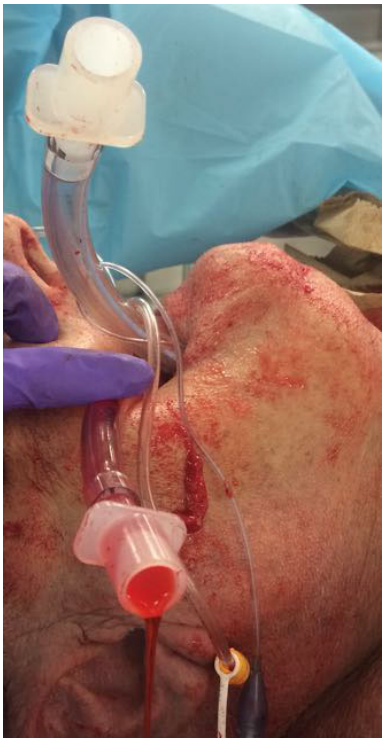

Figure 10 – Adabonyan

11 Impact of Preprocedural Fasting on Sedation-Associated Adverse Events in Pediatric Emergency Sedation

Maala Bhatt[1], David W. Johnson[2], Nick Barrowman[1], Ken J. Farion[1], Andrew Dixon[3], Suzanne Beno[4], C. Michelle McTimoney[2], A. Sasha Dubrovsky[5], and Jason Chan[1]
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Background: Appropriate preprocedural fasting for children who receive sedation in the ED remains controversial. Current guidelines are not evidence based and have not been shown to impact patient safety. Existing studies lack statistical power to draw conclusions about the association between fasting duration and adverse events.

Objectives: To examine the relationship between fasting duration and adverse events in ED procedural sedation in a large sample of children.

Methods: Children (0-18 years) undergoing sedation in 6 Canadian pediatric EDs were prospectively enrolled from Jul 2010-Feb 2015. Documentation of study and clinical information occurred simultaneously using a standardized electronic tool on tablet computers. Built in error checking ensured complete data at the time of entry. Data documented included demographics, sedation drugs, procedures performed, intake of solids and liquids, adverse events and interventions performed. Standardized terminology and definitions were used according to the Quebec Guidelines. Association between

fasting duration and adverse events was examined using univariate (Mann-Whitney) and multivariate logistic regression models.

Results: Of the 6295 children enrolled (mean age 8.0±4.6, 67% male, 99.8% ASA class I/II), 3091 (49%) and 422 (7%) did not meet fasting guidelines for solids (NPO ≥ 6hr) and clear liquids (NPO ≥ 2hr) respectively. Sedation medications included ketamine (65%), ketamine+propofol (14%), propofol±fentanyl (16%) and ketamine+fentanyl (3%). Fasted and unfasted children were similar with respect to age, sex, and ASA class. Unfasted children were more likely to receive ketamine (71%vs.61%, p<0.001). When examined in 1hr time intervals prior to sedation, the occurrence of adverse events did not increase as fasting duration decreased. When examined as a continuous variable, in univariate comparison and when adjusted for age, sex and sedation medication, there was no significant association between fasting duration (for solids or liquids) and sedation-related adverse events (See Bhatt Table1). No patient experienced clinically apparent pulmonary aspiration.

Conclusion: There was no significant association between preprocedural fasting duration and the occurrence of sedation-related adverse events.

Bhatt Table 1: Effects of NPO solid + liquid time on the procedural sedation outcomes

	NPO solid (hr) OR (95%CI)	NPO fluid(hr) OR (95%CI)
Any adverse event	1.009 (0.989,1.028)	1.004 0.982,1.027)
Serious events	1.027 (0.967,1.081)	1.019 (0.950,1.081)
Oxygen desaturation	1.003 (0.975,1.031)	1.006 (0.974,1.037)
Vomiting	1.001 (0.972,1.030)	0.997 (0.963,1.029)

12 Use of a Dental Vibration Tool to Reduce Pain from Digital Blocks—a Randomized Controlled Trial

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Background: The infiltration of local anesthetic is consistently described as painful by patients (pts). Vibration anesthesia has been studied in the dental literature as a promising tool to alleviate the pain from dental nerve blocks. Many of these studies utilized a specific device, The Dental Vibe ®. To date, there have not been any studies applying this technology to digital blocks of the hand in human subjects.

Objectives: We hypothesized that the use of micovibratory stimulation during digital blocks of the hand would decrease pain reported by patients.

Methods: Randomized, controlled trial of consenting adult ED pts who received digital block anesthesia for hand digit therapy when study authors present. Study period was 24 months at an academic ED. A sample size of 50 injections (25 subjects) was necessary for a power of 80% to detect a mean difference of 2 on the pain scale (standard deviation = 2.5). A two-sided dorsal injection approach used for digital blocks. Subjects randomized to either intervention (vibration) for the first injection, or sham (device off). Both intervention and sham were held in place for 5 seconds prior to, and during injection. Subjects were given 2 ml of 1% lidocaine and asked to rate the injection pain on a 0-10 scale. This process was then repeated. Mean pain scores compared using paired t-tests. Our primary outcome was the difference in mean injection pain score between sham vs. intervention groups.

Results: 25 patients in study group; mean age 35.52 years (range 18-58 years), 8 females, 11 Non-Hispanic White. The mean injection pain score in the sham group was 4.28 (95%CI 3.14 - 5.42) and in the intervention group the mean pain score was 2.52 (95%CI 1.62-3.42). For the primary outcome, the mean injection pain score difference between sham and intervention group across all subjects was 1.76 (95%CI 0.49 - 3.03, p = 0.009). The mean injection pain score differences were similar across groups: females vs. males (0.24; 95%CI -2.31 to 2.79, p = 0.85), non-hispanic whites vs. other races (0.76;95% CI -1.78 to 3.29, p = 0.54), intervention first vs. sham first (-0.43; 95%CI -3.25 to 2.40, p= 0.75).

Conclusion: Our results show a statistically significant difference in mean injection pain score during digital block of the hand when the Dental Vibe® device is used for vibration anesthesia. Larger studies warranted to confirm our findings.

13 Identification of Frequent Emergency Department Users Increases with Increased Health Information Exchange Size

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Background: Frequent ED use is a marker for poor access to primary care and poor control of chronic disease. Frequent ED users may be difficult to identify because they often visit multiple EDs in a region.

Objectives: We hypothesized that increasing the number of facilities participating in a health information exchange (HIE) would improve identification of frequent ED users using HIE data.

Methods: Using de-identified data from the Healthix HIE (covering ~2/3 of EDs in NYC) from 03/01/09 to 02/28/14, we measured the detection rate of frequent ED users from three perspectives: (1) site-specific data, (2) a precursor HIE with 10 hospitals, and (3) the current 31-site HIE (Healthix). We divided ED users into 3 mutually exclusive groups: (1) high frequency (HF) ED users (≥ 4 visits in any given month), (2) medium frequency (MF) ED users (≥ 4 visits in any given year), and (3) infrequent (IF) ED users (< 4 visits in any given year).

Results: Healthix had 3,704,342 ED patients and 8,243,104 ED visits. Of these, 1.5% patients were HF and 6.2% were MF ED users. We identified 10.1% more frequent ED users when expanding from site-specific to 10-site HIE-wide data, and 18.6% more when expanding from site-specific to 31-site HIE-wide data, for an 84.1% relative increase in our ability to identify these patients when expanding from a 10-site HIE to a 31-site HIE. HF users were 48.3% male, but for patients with > 100 ED visits 71.1% were male. The median numbers of visits over the study period were 1 [1-2] (median [IQR]) for IF ED users, 7 [5-9] for MF ED users, and 9 [6-16] for HF ED users (p< 0.001 by Kruskal-Wallis test). The percentages of patients who visited >1 ED were 9.4% for IF ED users, 40.5% for MF ED users, and 44.8% for HF ED users (p< 0.001 by $\chi 2$ test). There were 205 patients who visited ≥ 10 hospitals, 11 patients who visited ≥ 20 hospitals, and one who visited 29 of the 31 EDs. There were 409 patients with > 100 ED visits, and 44 patients with > 300 visits. The maximum number of visits of a single patient was 987.

Conclusion: Inclusion of more sites in HIEs improves identification of frequent ED users. This may allow earlier enrollment of high risk individuals into programs that enhance outpatient services, such as case management, which may reduce avoidable ED visits, decrease healthcare costs, and improve quality of care.

14 Profile of Emergency Department Utilization by High Cost Medicare Beneficiaries

Laura G. Burke[1,2], E. John Orav[3], and Ashish K. Jha[2,4]

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Chan School of Public Health, Department of Health Policy and Management, Boston, MA; [3]Harvard T.H. Chan School of Public Health, Department of Biostatistics, Boston, MA; [4]Brigham and Women's Hospital, Division of General Internal Medicine, Boston, MA

Background: Health care costs are a problem in the United States and a small number of individuals account for the majority of spending. Policymakers have focused on "excessive" ED use among these expensive patients.

Objectives: We sought to characterize ED utilization for high cost Medicare patients in the U.S.

Methods: We calculated mean total standardized cost for all Medicare services for each beneficiary age 65 or greater and defined high cost beneficiaries (HCBs) as those the top decile of mean total standardized Medicare costs. We identified all ED visits among both HCBs and non-HCBs using research identifiable files. We compared the two groups with respect to demographic characteristics, chronic conditions, number of ED visits, fraction of costs attributable to ED visits, admission rate and most frequent diagnoses.

Results: There were 5,605,362 beneficiaries in our sample, of which were 560,536 were HCBs. HCBs had a mean of 2.0 ED visits as compared to 0.3 visits for non-high cost beneficiaries. The HCB group was older (79.1 vs. 75.1; p<0.0001), had a substantially greater burden of chronic conditions (6.1 vs. 1.5 conditions; p<0.0001), had more beneficiaries who were also Medicaid eligible (20%vs. 12%; p<0.0001). The HCB group were slightly less likely to be men (41.9 vs. 43.7%; p<0.0001) and had a greater proportion of whites (87.5% vs. 86.0%; p<0.001) and blacks (8.1 vs. 7.5%;P<0.0001) but fewer Asians (1.1% vs. 1.9%;p<0.0001) and those classified as "other" (1.0 vs. 1.7%;p<0.0001). A greater fraction of visits by HCBs resulted in admission (55.9% vs. 24.1%; p<0.0001). While HCBs had more than 4 times the total cost of outpatient ED care, outpatient ED visits represented a small proportion of total Medicare costs for both HCB (1.0%) and non-HCB (2.9%) (See Table).

Conclusion: HCBs havemore ED visits and more hospitalizations, likely because they are older and substantially sicker. Despite their higher costs and utilization, ED visits alone represent a relatively small fraction of their total Medicare spending. These findings suggest that the ED may not be the most fruitful place to focus if the goal is to reduce healthcare costs for high cost beneficiaries.

Table 1. Outpatient ED and Overall Costs for High Cost and Non-High Cost Medicare Beneficiaries

	N	Mean Cost Per Outpatient ED Visit	Mean Annual Outpatient ED Cost Per Beneficiary	Mean Annual Total Cost Per Beneficiary	ED Cost Fraction*
High Cost	560,536	$693	$597	$57,088	1.0%
Non-High Cost	5,044,826	$589	$138	$4,732	2.9%
Overall	5,605,362	$619	$184	$9,967	1.8%

*ED Cost Fraction is the proportion of total standardized cost attributable to outpatient ED visits

Table 14: Burke.

15 Relationship Between Admission Rate and Outcomes for Medicare Beneficiaries

Laura G. Burke[1,2], E. John Orav[3], and Ashish K. Jha[2,4]

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Background: Admission rate from the ED varies widely across hospitals, leading some to suggest that reducing admissions may reduce health care costs. However, critics worry that efforts to reduce admissions may harm patient outcomes.

Objectives: We sought to understand the relationship between hospital level admission rate and 30 day mortality for Medicare beneficiaries with congestive heart failure (CHF), pneumonia (PNA), and chronic obstructive pulmonary disease (COPD).

Methods: We identified all ED visits among elderly Medicare beneficiaries to acute care hospitals in the U.S. in 2013 using national Medicare research identifiable files. We calculated each ED's risk-adjusted admission rate for CHF, PNA and COPD. We chose these conditions because they are common, morbid, and are likely to have substantial variation in admission rate. We adjusted for patient and hospital characteristics. We used logistic regression, adjusted for patient clustering within hospitals, to examine individual 30-day mortality rate as a function of the risk-adjusted hospital admission rate. We also included patient disposition from the ED, patient characteristics and hospital characteristics in the model. We conducted the analyses separately for CHF, PNA and COPD and stratified by patient disposition.

Results: There were 5,534,269 beneficiaries in our sample with 173,580 ED visits for one of the three conditions. The mean rates of admission for CHF, PNA and COPD were 74%, 77% and 53% respectively. There was substantial variation in condition-specific admission rates by hospital (Table). In our multivariable model, we found no meaningful relationship between risk-adjusted hospital-level admission rate from the ED and risk-adjusted 30-day mortality for admitted or discharged patients for any of the three conditions (Table).

Conclusion: In contrast to previous work done for chest pain, we found no relationship between an ED's rates of discharge and subsequent outcomes for those patients for three common conditions. Our results suggest that EDs with low admission rates have found ways to successfully manage a greater number of beneficiaries as outpatients without sacrificing quality.

Table 1. Relationship between 30-Day Mortality and Hospital Level Risk-Adjusted Admission Rate from the ED

	Admission Rate Median	Admission Rate Interquartile Range	OR 30 Day Mortality	95% CI	P-value
CHF	73.2%	30.9%	0.99	0.94-1.05	0.82
PNA	77.6%	22.0%	1.02	0.96-1.08	0.58
COPD	51.9%	30.6%	1.01	0.95-1.08	0.73

*Odd Ratio Refers to change in 30-day mortality for discharged patients for each 10% increase in hospital level-admission rate for each condition and is adjusted for patient and hospital characteristics

Table 15: Burke.

16 Changes in Emergency Department Use by Insurance Status in Illinois After Implementation of the Affordable Care Act

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Background: Prior evidence indicates an increase in ED visits following insurance expansions. The effects of the most recent insurance expansion through the Affordable Care Act (ACA) on ED use is unknown.

Objectives: The objectives were: describe changes in total ED visits, and per-capita ED use by disposition and payer in Illinois after implementation of the ACA.

Methods: A retrospective analysis of hospital administrative billing data for all ED visits for patients 18-64 in Illinois from 3rd quarter (q3) 2010 to 1st quarter (q1) 2015. One year census estimates from the American Community Survey were used for 18-64 population denominators by payer. Data were aggregated by quarter and linear regression was performed testing the significance of mean quarterly

n (%)	Pre – Affordable Care Act				Post – Affordable Care Act		Adjusted Additional Annual ED visits	p
	2010 (q3 & q4)	2011	2012	2013	2014	2015 (q1)		
Total Visits	1,445,024	2,950,724	3,035,628	2,987,882	3,108,872	770,704	**145,844**	**0.007**
Admissions	178,307 (12.3)	355,558 (12.0)	349,568 (11.5)	357,069 (12.0)	351,244 (11.3)	86,786 (11.3)	-2,932	0.580
Insurance								
Private	575,869 (39.9)	1,161,283 (39.4)	1,200,528 (39.5)	1,153,889 (38.6)	1,239,837 (39.9)	328,849 (42.7)	**89,608**	**0.001**
Medicaid	394,881 (27.3)	819,815 (27.8)	831,418 (27.4)	825,955 (27.6)	1,109,613 (35.7)	290,307 (37.7)	**310,236**	**<0.001**
Uninsured	332,448 (23.0)	670,015 (22.7)	687,267 (22.6)	701,392 (23.4)	457,298 (14.7)	81,249 (10.5)	**-248,956**	**<0.001**
Medicare	127,573 (8.8)	269,026 (9.1)	280,339 (9.2)	286,943 (9.6)	275,784 (8.8)	61,918 (8.0)	-3,776	0.626

Table 16: Dresden.

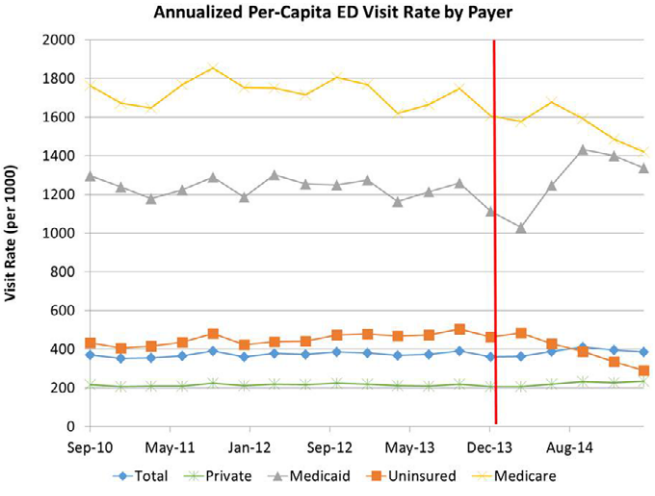

Figure 16 – Dresden

differences in visits, admissions, and per-capita visit rates from 2010-2013 (pre-ACA) and 2014-2015 (post ACA), adjusting for season.

Results: Over 14 million ED visits were included. Post-ACA, there was an annual increase in ED visits, β=145,844 (p=0.007), but no significant change in admissions, β=-2,932, (p=0.580). Visits by uninsured patients decreased, β=-248,956 (p<0.001), Medicaid visits increased β=310,236 (p<0.001), and private insurance visits increased β=89,608 (p=0.001), Medicare visits had no change β=-3,776(p=0.626) **(Table 1)**. The overall ED visit rate per 1000 residents increased β=18.8 (p=0.005), admissions were unchanged β=-0.32(p=0.642). Visit rate decreased for uninsured patients β=-66.08 (p=0.02), and Medicare β=-160.2 (p=0.001), increased for private insurance β=9.6 (p=0.02), Medicaid had no significant change β=72.7 (p=0.142) **(Figure 1).**

Conclusion: After implementation of the ACA in Illinois, ED visits increased 4.9% overall, 37.8% for Medicaid, 7.7% for private insurance, and decreased 36.4% for uninsured patients, but there was no increase in admissions through the ED. These changes are consistent with prior studies of ED use after health insurance expansion, but are contrary to the suggestion by some policymakers that the ACA would decrease ED use. Per-capita visit rates suggest that patients remaining uninsured after the ACA may have better access to outpatient care or less need for emergency care than previously uninsured patients now covered by private insurance or Medicaid.

17 The Changing Landscape of Emergency Department Visits in California

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Background: The Affordable Care Act (ACA) was implemented to improve healthcare insurance coverage by the expansion of public insurance programs (depending on the State) and the creation of health insurance exchanges for eligible individuals to purchase insurance at affordable rates. The ACA-associated insurance exchange opened for enrollment in 2013 and coverage began on January 1, 2014.

Objectives: The objective of this study was to assess ED utilization and patient insurance coverage in California before and after the implementation of the ACA.

Methods: This was a multi-center retrospective before-after study of 326 licensed non-military acute care hospitals in California from January 1, 2013 (pre ACA) through December 31, 2014 (post ACA). We reported the change in ED utilization overall and by demographic characteristic between the two periods is reported. Insurance coverage (Private, Medicare, Medi-Cal, Self-Pay/Indigent) by age group (18-24, 25-44, 45-64 and 65+) is also reported. Numbers, percentages and differences with 95% confidence intervals (CIs) are reported.

Results: The combined patient census increased by 661,782 visits from 12.7 million in 2013 to 13.4 million visits in 2014. Overall, Self-Pay/Indigent significantly decreased from 18.99 to 11.96% (Diff = 7.03%, 95% CI=7.00%-7.06%), while Medi-Cal (California's Medicaid program) increased from 28.55% to 36.32% (Diff =7.78%, 95% CI=7.74% -7.81%) of ED visits. Private and Medicare coverage both decreased by less than 1% (0.5% and 0.2%, respectively). When stratified by age group, similar changes in insurance coverage were seen in those 18-24, 25-44 and 45-64 years of age with the largest change in coverage among visits of patients 45-64 years of age in Self-Pay/Indigent (23.72% to 11.21%, Diff = 12.51%, 95% CI=12.45%, -12.57%) and in Medi-Cal (21.9% to 34.9%, Diff = 12.94%, 95% CI= 12.87%, -13.01%).

Conclusion: In this multicenter study of 326 non-federal hospital EDs in California to assess the impact of the ACA on insurance coverage for ED patients, self-pay/indigent significantly decreased, while Medicaid coverage significantly increased. The change in the proportion of visits with Private or Medicare coverage was minimal. These findings are very early in the implementation of the ACA and require additional studies both geographically and temporally.

18 Trends in ED Practice Intensity Among Medicare Beneficiaries

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Background: Billing for the highest intensity of ED care has risen over the last decade. It is unclear whether this represents changes in coding versus trends in actual practice.

Objectives: We sought to characterize the trends in billing for high intensity ED care among Medicare beneficiaries as well as trends in ED and inpatient procedures. We also examined if there were differential trends by clinical condition.

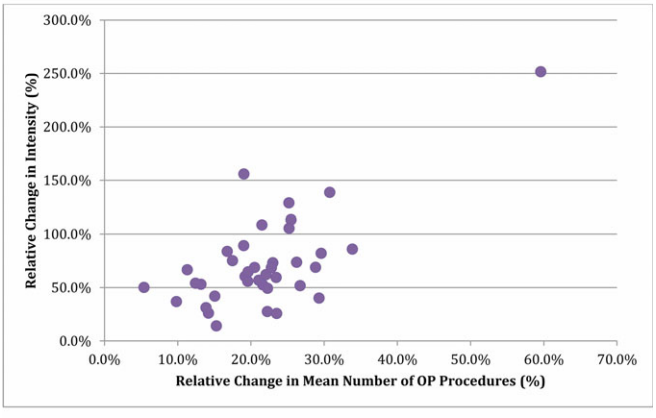
Methods: We used Medicare fee-for-service claims to identify ED visits in 2006, 2009 and 2012 for continuously enrolled, elderly Medicare beneficiaries presenting to nonfederal acute care hospitals. High-intensity visits were defined by physician evaluation and management CPT codes 99285, 99291, and 99292, and low intensity visits were those coded as 99281-99284. We tested for time trends in practice intensity and procedures using logistic regression adjusting for patient characteristics. We categorized outpatient visits into one of 39

previously validated diagnosis categories. For each category, we plotted the relative change in proportion of high intensity visits versus the relative change in number of procedures.

Results: High intensity visits grew from 45.5% of 671,103 visits in 2006 to 57.7% of 629,010 visits in 2012. There was also an increase in the mean number of inpatient (1.28 to 1.41; p<0.0001) and outpatient procedures (7.11 to 8.6; p<0.0001). The relative change in practice intensity varied by condition category with ischemic heart disease having the lowest relative change (8.5% change; from 84.5% to 91.7%) and "Other Injuries" for having the greatest (251.5% change; from 6.9% to 24.2%). We found that those diagnoses with greater increases in intensity also tended to have a greater increase in procedures (Figure 1).

Conclusion: The increase in high intensity billing for ED care has been accompanied by an increase in procedures. The parallel trends for individual diagnoses indicate that at least some of the increase in billing is explained by the amount of clinical work performed.

Figure 1, Relative Change in Proportion of ED Visits Billed as High Intensity versus Relative Change in Mean Number of Procedures per Outpatient Visit by Diagnosis Category*



* Changes are aggregated across hospitals and showed for each condition category
** Outpatient procedures are categorized by Healthcare Common Procedure Coding System (HCPCs) codes

Figure 18 – Burke

19 Early Lactate Level is Associated with 28-day Mortality in Pediatric Sepsis

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[1]University of Colorado School of Medicine, Aurora, CO; [2]Children's Hospital Colorado, Aurora, CO; [3]Colorado School of Public Health, Aurora, CO

Background: Lactate level is associated with organ dysfunction in pediatric sepsis. Despite routine use of lactate testing in adult sepsis, pediatric guidelines do not endorse its use, citing an absence of studies associating lactate level with mortality.

Objectives: To test if serum lactate level is associated with 28-day mortality in children with suspected sepsis in the emergency department/urgent care (ED/UC). Hypothesis: serum lactate >4 mmol/L is associated with increased mortality compared to lactate ≤4 mmol/L.

Methods: Retrospective cohort study using a sepsis registry at six affiliated pediatric ED/UC's with annual volumes >155,000 and a sepsis program. Patients were diagnosed clinically with sepsis following national guidelines, and included in the registry by presence of a sepsis protocol time stamp in the electronic health record. Data were extracted from the electronic health record into a deidentified database. Exclusion criteria were: age ≤60 days, ≥18 years. The first lactate level measured during the first 6 hours after arrival was included for analysis. Lactate testing is recommended in the clinical protocol but may be overridden by providers. Relative risk of 28-day mortality was compared among patients with lactate >4, 2-4, <2 mmol/L and unmeasured. An adjusted relative risk was calculated using the log-binomial model to account for potential confounders.

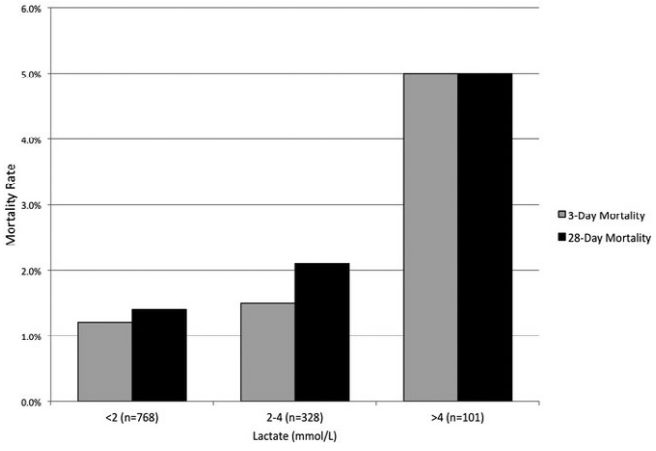

Figure 19 – Scott

Table 1.
Scott: Unadjusted and Adjusted Relative Risk of 28-Day Mortality by Lactate Level

RR >2 vs. ≤2 mmol/L	aRR >2 vs. ≤2 mmol/L	RR >4 vs. ≤4 mmol/L	aRR >4 vs. ≤4 mmol/L	RR Unmeasured vs. Measured
2.0	1.9	3.0	3.2	0.3
95% CI 0.9-4.5	95% CI 0.8-4.3	95% CI 1.1-8.0	95% CI 1.2-8.5	95% CI 0.1-0.7

Results: From 4/12-9/15, 2025 patients were evaluated for sepsis; 59.1% had lactate measured.

Conclusion: In children treated for sepsis in the ED, elevated lactate levels were associated with mortality. This adds to growing evidence that lactate is useful in ED recognition of pediatric sepsis. Initial lactate >4 mmol/L was significantly associated with 28-day mortality in unadjusted and adjusted analyses (Fig 1, Table 1). Patients with unmeasured lactate had decreased risk of mortality. ED hypotension and hematologic organ dysfunction were significant covariates in the multivariate model.

20 National Epidemiology of Pediatric Injuries Related to Two-Wheeled Motorized Recreational Vehicles Presenting to U.S. Emergency Departments

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Background: Though much research exists on injuries resulting from all-terrain vehicles and dirt bikes, little has been published on injuries resulting from use of other recreational two-wheeled motorized recreational vehicles such as mopeds, scooters, and minibikes.

Objectives: The objective of this study was to describe the epidemiology of injuries presenting to U.S. emergency departments (EDs) from these products. We hypothesized that scooters would be the most common source of injury and males would be more frequently injured than females.

Methods: Injuries from two-wheeled motorized vehicles were evaluated from January 1, 2003 to December 31, 2013 using the Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS). Eligible participants were identified using product codes 3215, 5035, and 5042. Narratives were used to confirm injury diagnosis and to classify the mechanism of injury according to pre-defined criteria. National injury estimates were calculated using weighted data. Descriptive statistics were used to characterize the study sample, injury patterns, and ED disposition.

Results: Between 2003 and 2013 there were an estimated 76,252 ED visits related to injuries from scooters (53.8%), mopeds (27.8%), and mini-bikes (18.4%), and Injuries were most common among males (65%) and among children aged 12-15 (39.5%). The most common diagnoses were fractures (25.4%), contusions/abrasions (23.7%), and lacerations (18.7%) to the upper and lower extremities. The most common mechanism of injury was a fall from the vehicle (51.7%), followed by severe complicated fall involving striking an object before falling off the vehicle (11.2%). The majority of patients were treated and released from the ED (89.3%).

Conclusion: Two-wheeled powered motor vehicles are a substantial source of injuries resulting in visits to the ED, primarily affecting male adolescent patients. Injury patterns presented in this study provide insight for injury prevention measures such as protective equipment and education.

21 Prospective Evaluation of the Pediatric Emergency Care Applied Research Network (PECARN) Cervical Spine Injury Risk Factors

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Background: Lack of established cervical spine injury (CSI) screening criteria for children who experience blunt trauma leads to unnecessary interventions and possible harm in the prehospital and emergency department (ED) settings.

Objectives: The purpose of our study was to determine the test accuracies of previously retrospectively-identified risk factors of CSI in children in a prospective cohort as a prerequisite to developing a pediatric CSI risk assessment tool.

Methods: We conducted a 4-center, prospective observational study of children <18 years old who experienced blunt trauma and were either transported from the scene of injury in spinal precautions, evaluated by a trauma team, and/or underwent cervical spinal imaging. Children were excluded if they experienced only penetrating trauma, were transferred from another facility for definitive care, were in the State's custody, or there was a substantial language barrier. We collected data from ED providers for risk factors previously reported to be associated with CSI in children. For each factor, we calculated the bivariable relative risk for CSI (RR) with 95% confidence interval (CI). We also calculated the multivariable RR with 95% CI, sensitivity and specificity for the PECARN CSI model and the multivariable odds ratios (OR) for each model risk factor.

Results: We enrolled 3665 children; 63 (1.7%) had CSI. There were 18 factors independently predictive of CSI. The PECARN model RR (95% CI) was 12.4 (4.5-34.0), the sensitivity was 93.7% and specificity was 46.4%.

Figure 1 Risk Factors for CSI in Children

Risk Factor	Bivariable RR (CI)	PECARN Model Multivariable OR (CI)
Mechanism of Injury/Biomechanics		
High risk MVC*	1.1 (0.3-3.3)	1.0 (0.3-3.2)
Diving	15.5 (6.4-37.5)	21.8 (6.4-74.3)
Axial load	3.1 (1.6-6.0)	~
Clothes-lining	3.8 (1.2-11.6)	~
History		
Predisposing condition	2.5 (0.4-16.9)	1.0 (0.9-1.9)
Loss of consciousness	2.2 (1.3-3.8)	~
Neck pain	2.2 (1.3-3.5)	1.4 (1.0-2.0)
Inability to move neck	4.2 (2.3-7.7)	1.0 (0.8-1.2)
Paresthesias	0.3 (0.1-2.4)	~
Numbness	0.5 (0.1-3.4)	~
Weakness	0.6 (0.1-4.3)	~
Physical Exam		
Altered mental status	5.0 (3.1-8.2)	2.4 (1.2-4.8)
Signs of substantial head injury other than altered mental status	0.2 (0.03-1.6)	~
Signs of basilar skull fracture	3.7 (1.2-11.4)	~
Posterior midline tenderness to palpation	1.7 (1.1-2.9)	~
Limited neck range of motion on exam	2.2 (1.0-4.5)	1.3 (1.1-1.6)
Substantial torso injury	2.5 (1.2-5.5)	1.5 (1.1-1.9)
Substantial thoracic injury	6.4 (2.7-15.2)	~
Respiratory distress	15.5 (6.4-37.5)	~
Decreased oxygen saturation	16.6 (6.1-45.0)	~
Substantial abdominal injury	1.6 (0.5-4.9)	~
Thoracic spine tenderness	1.2 (0.6-2.1)	~
Lumbar spine tenderness	0.4 (0.1-1.2)	~
Focal neurologic deficit	3.1 (1.3-7.5)	1.0 (0.7-1.4)
Decreased sensation	2.7 (0.7-10.7)	~
Weakness	2.1 (0.5-8.3)	~

*Intrusion, including roof: >12 inches occupant site, > 18 inches any site; Ejection (partial or complete) from automobile; Death in same passenger compartment; Vehicle telemetry data consistent with a high risk of injury

Table 21: Leonard.

Conclusion: Our findings support the previously-identified risk factors for CSI in children and the need for prospective refinement of the PECARN model for use as a pediatric risk assessment tool following blunt trauma.

22 ED Utilization Prior to a Suicide and Self-Inflicted Injury Related ED Visit

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Background: With decreasing community psychiatric services and challenges for patients gaining access to care and medications, ED's are often a safety net for this population of patients. With increased awareness and mandatory screening for suicidality and self-harm (SASH) of patients who present to the ED, it is still likely that there are patients who present with a suicide attempt that were recently seen prior in the ED.

Objectives: The objective of this study was to identify and describe ED visits prior to a SASH related ED visit.

Methods: A multi-center retrospective longitudinal cohort study of ED visits from 325 licensed non-military acute care hospitals in California in 2013 using non-public data. Visits without a valid patient identifier and patients under the age of 13 years or who expired were excluded. SASH index visits were identified using external cause-of-injury codes (E-codes 950-959). The primary outcome was ED utilization excluding admits/transfers within 3 days prior to a SASH related ED visit. Logistic regression was used to assess independent associations between patient and visit characteristics between those who had prior utilization and those who did not.

Results: A total 12,717,896 ED visits were included in the study period, of which 29,213 patients met inclusion and exclusion criteria resulting in 33,009 index ED visits. A total of 2,416 (8.3%) patients had 2,675 ED visits within 3 days of presenting with their SASH ED visit. Primary E-Codes of the preceding ED visits were Suicide and Self-Inflicted Injury (10.1%), Other Accidents (5.2%) and Accidental Falls (3.5%). A total of 1,111 (41.5%) prior ED visits were to an acute care

facility different than the index visit. Factors with the strongest association with an ED visit 3 days prior to the index ED visit were age (25-34 years of age, OR 1.8, 95% CI =1.6 to 2.0; 35-44 years of age, OR 1.7, 95% CI = 1.5 to 2.0; and, 45-54 years of age, OR 1.8, 95% CI = 1.5 to 2.0; ref=13 to 24 years of age) and Payer (Medicare, OR 1.9, 95% CI = 1.7 to 2.2 and Medi-Cal, OR 2.3, 95% CI = 2.0 to 2.6; ref=Private).

Conclusion: In this multicenter study in California, a high percentage of patients were seen in an ED within 3 days prior to a SASH related ED visit. There may be potential for additional ED-based interventions to decrease suicide and self-inflicted injury.

23 Time-to-Antibiotics for Critically Ill Patients with Suspected Severe Sepsis is Significantly Longer for Pediatric Patients than Adults

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Background: Delayed antibiotic administration for sepsis is associated with a worsened outcome in both adult and pediatric patients. Recognition of sepsis in pediatric patients is challenging as they often lack the characteristics associated with adult presentation.

Objectives: The goal of this study is to compare the time to antibiotic administration between pediatric and adult patients presenting with suspicion of sepsis.

Methods: This is a retrospective observational descriptive analysis of patients admitted to the ICU from the emergency department (ED) of an academic medical center with a dedicated pediatric ED between November 1, 2013 and August 30, 2015. Time to antibiotics was defined as the interval between arrival time and the first antibiotic infusion. The following age categories were compared: 0-59 days, 60 days-6 months, >6-12 months, >12-24 months, >24-60 months, >60 months-8 years, 18-years and over. A Kruskal-Wallis test was used to compare differences between the groups. A Wilcoxon signed-rank test was performed to compare each age group to the goal time to antibiotics of 3 hours. An ANOVA was performed with Bonferroni correction for multiple comparisons to evaluate statistically significant mean differences between groups.

Results: A total of 4440 patients were eligible for inclusion and 1901 met inclusion criteria. There was an overall difference in time to antibiotics between the groups, ($p<0.001$). The median (IQR; p-value for H_o=3 hours) time to antibiotics were: patients 0-59 days (n=27) 4.48 hours (3.13-6.78; $p<0.001$), 60 days-6 months (n=25) 3.17 hours (2.13-4.42; $p=0.33$), >6-12 months (n=9) 2.35 hours (2.17-4.53; $p=0.44$), >12-24 months (n=21) 3.35 hours (1.72-5.6; $p=0.25$), >24-60 months (n=17) 5.62 hours (3.1-7.75; $p=0.004$), >60 months-8 years (n=10) 4.95 hours (3.02-6.02; $p=0.04$), >18 years (n=1792) 2.78 hours (1.57-4.93; $p=0.003$). The 25m-60m age group was significantly different from adults when comparing Bonferroni corrected ANOVA.

Conclusion: Door to antibiotic times were significantly longer among pediatric patients compared to adults, with several age groups significantly longer than the goal of 3 hours. This shows that pediatric patients are particularly vulnerable to delayed antibiotic administration when presenting to the ED with sepsis.

24 Survival Benefit and Cost Savings from Emergency Department Compliance with a Basic 3-Hour Sepsis Bundle in a Multisite, Prospective, Observational Study

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Background: Sepsis is a leading cause of mortality and healthcare spending. The impact of ED compliance with sepsis bundles is an area of active investigation.

Objectives: To assess the impact of ED compliance with a basic 3-hour bundle on mortality, LOS, and cost outcomes.

Methods: Observational study of severe sepsis/septic shock patients prospectively entered into a health system's dedicated sepsis quality improvement database over Medicare Fiscal Year 2014. Clinical data was merged with financial data abstracted from an accounting database for analysis. *Setting*: 4 urban tertiary care and 4 community hospitals in the New York metropolitan area. *Bundle elements from Tzero*: 30cc/kg IV fluid bolus ≤ 30 minutes, lactate result ≤ 90 minutes, blood cultures drawn before antibiotics, broad spectrum IV antibiotics ≤ 180 minutes. *Inclusion criteria*: ≥ 2 SIRS criteria + lactate ≥ 2.2 or sBP < 90 or organ dysfunction. *Exclusion criteria*: <18, advance directive precluding bundle, interventions declined. *Study Assessments*: demographics, clinical data, LOS, mortality, total direct hospital costs (TDC). TDC = fixed + variable direct costs. Fixed direct costs are overhead costs (e.g. physician salaries). Mortality, LOS, and cost differences in compliant (C) v non-compliant (NC) groups assessed by t-test, Mann Whitney, log rank, or chi square with P-values, 95% CI as appropriate. Multiple logistic, linear regression, Cox proportional hazards models assessed bundle compliance as a predictor of mortality, TDC, and LOS, respectively.

Results: 5,358/19,148 (28.0%) subjects were bundle compliant. Data presented as C v NC groups. Sex: 54% v 50% male. Mean Age: 73 v 73. Tertiary Care Site: 73.3% v 80.1%. Mortality: 17.2% v 22.1% (CI 3.6-6.1%) p<0.001, Number Needed to Treat = 20 (CI 16-28). Mean TDC: $16,147 v $21,265 (CI $4,208-6,028) p<0.001, Mean Cost Savings/Mortality Prevented = $102,360 (CI: $67,328-168,784). Median LOS: 7 v 8 days, p<0.001. In adjusted regression, compliance was associated with 29% lower mortality (odds ratio: 0.71, CI 0.64-0.78, p<0.001), a $1,551 TDC reduction (β = -$1,551, CI -$778 - (-)$2,324, p<0.001), and 12% shorter LOS (inverse hazard ratio: 0.88, CI 0.82-0.97, p=0.002).

Conclusion: ED compliance with a 3-hour sepsis bundle was associated with improved survival, LOS, and cost savings.

25 Evaluation of Intravascular Volume Status Using Dynamic Respiratory Induced Bioimpedance of the Limb

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Background: Assessment of volume status in critically ill patients continues to pose a challenge to clinicians. Measuring dynamic changes in the inferior vena cava (IVC) diameter through ultrasound is becoming a standard tool to assess volume status and guide therapy. However, ultrasound imaging requires training, is difficult to use in certain patients, and frequent monitoring especially in multiple patients is impractical. Development of methodologies that leverage the physiology of venous return in response to respiration may provide means to assess intravascular volume changes and allow improved scaling and less expertise compared to traditional ultrasound.

Objectives: To evaluate the use of bioimpedance to monitor the movement of blood in the arm in response to respiration. We hypothesized that dynamic changes in bioimpedance of the limbs in response to respiration could be used to assess intravascular volume status and its performance would be comparable to IVC ultrasound.

Methods: Forty six patients undergoing hemodialysis were recruited. Testing with bioimpedance and ultrasound was done at the beginning and end of the hemodialysis session. Upper arm impedance was measured via a tetra-polar electrode arrangement (injects 0.1-1 mA). Simultaneously, the IVC diameter was measured by ultrasound in the subcostal longitudinal view in B mode by experienced sonographers who were blinded to impedance changes. Subjects were asked to

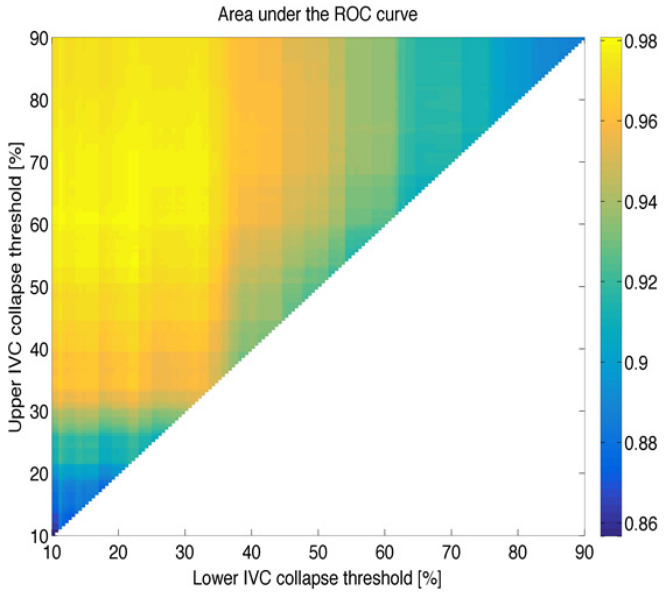

Figure 25 – Tiba

perform a respiratory maneuver by inhaling through a respiratory training device.

Results: Peak-to-trough impedance difference (dz) was determined, normalized to baseline breath and compared to the IVC collapsibility index (dIVC) (percentage IVC change in diameter during the respiratory maneuver) (r=0.76, $p < 0.0001$). Receiver operator curves for dz at thresholds of dIVC ranging between 20% to70% demonstrated high predictive power of dz with areas under the curves between 0.92 and 0.99 ($p < 0.0001$) when compared to IVC ultrasound (Figure).

Conclusion: Real-time dynamic changes in limb impedance are capable of tracking a wide range of dynamic dIVC when compared to IVC ultrasound. This technique might be a suitable surrogate for monitoring real-time changes in dIVC to assess intravascular volume status.

26 Early Epinephrine in In-Hospital Cardiac Arrest Patients with an Initial Shockable Rhythm: A Propensity Score Matched Analysis

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Background: American Heart Association recommends administration of epinephrine after the second defibrillation in cardiac arrest patients with a shockable rhythm.

Objectives: First, we sought to evaluate whether patients receive epinephrine ≤ 2 minutes after the first defibrillation (i.e. guideline non-compliant). Second, since the guidelines are supported only by expert opinion and not rigorous research, we evaluated the association between early epinephrine and outcomes in this population.

Methods: This was an analysis of prospectively collected data from the Get With The Guidelines®-Resuscitation registry that includes data from more than 300 United States hospitals. We included adult in-hospital cardiac arrest patients (including events in the emergency department) with an initial shockable rhythm. We included patients who had a first defibrillation within 2 minutes of the cardiac arrest and who remained in a shockable rhythm post-defibrillation. We calculated a propensity score for the receipt of epinephrine ≤ 2 min, including multiple patient, event, and hospital characteristics. Patients who received epinephrine at either 0, 1 or 2 min after the first defibrillation were then propensity score-matched with patients who were "at risk" of receiving epinephrine within the same minute but who did not receive epinephrine. The main outcomes was survival to hospital discharge

Results: 2978 patients were propensity score matched and the groups were well balanced. 1510 (51%) of the patients received epinephrine within two minutes after the first defibrillation outside current American Heart Association guidelines. Epinephrine ≤ 2 min after the first defibrillation was associated with decreased odds of survival in the propensity score-matched analysis (OR: 0.70 [95%CI: 0.59 - 0.82], $p < 0.001$). Early epinephrine administration was also associated with a decreased odds of ROSC (OR: 0.71 [95%: 0.60 - 0.83], $p < 0.001$) and good neurological outcome (OR: 0.69 [95%CI:0.58 - 0.83], $p < 0.001$).

Conclusion: Half of patients with a persistent shockable rhythm received epinephrine ≤ 2 min after the first defibrillation, contrary to current American Heart Association guidelines. The receipt of epinephrine ≤ 2 min after the first defibrillation was associated with decreased odds of survival to hospital discharge as well as ROSC and good neurological outcome.

27 Pre-Hospital Midazolam for Treatment of Status Epilepticus Before and After RAMPART: A National Observational Cohort Study

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Background: Translation of knowledge from clinical trial findings into medical practice is often challenging and is under-investigated, especially in the pre-hospital setting. Implementation of evidence-based treatment for status epilepticus can improve outcomes.

Objectives: We hypothesized that publication of the Rapid Anticonvulsant Medication Prior to Arrival Trial (RAMPART) altered the national use of midazolam for pre-hospital treatment of seizures and the associated rates of rescue therapy and invasive airway procedures.

Methods: This is a retrospective, observational cohort study. All adult and pediatric patients with convulsive seizure and pre-hospital treatment with a benzodiazepine in states that submitted full data to the National EMS Information System (NEMSIS) database in 2011 and 2014 were included in the study. Rates of midazolam use before and after the publication of RAMPART were calculated and stratified by geographic region. Secondary outcomes to evaluate the safety and efficacy of midazolam included the frequency of rescue therapy and invasive airway procedures.

Results: There were 68,138 eligible events identified within NEMSIS. The overall rate of midazolam use increased from 30.1% to 56.9% (difference +26.8%, 95%CI 26.0-27.5%). The rate of midazolam use increased in every level of urbanicity in all United States Census Regions. Nationally, rates of rescue therapy decreased from 25.3% to 24.7% (-0.6%, 95% CI -0.10 to 1.27%) and invasive airway procedures from 2.28% to 1.86% (-0.42%, 95% CI -0.20 to -0.65%). These changes were more pronounced for midazolam (rescue therapy -1.2%, 95% CI 0.12-2.36%; airway procedures -1.51%, 95% CI 1.06-2.01%) than other benzodiazepines (rescue therapy +1.1%, 95% CI 0.16-2.00%; airway procedures -0.24%, 95% CI -0.02 to 0.49%).

Conclusion: Prehospital midazolam use for status epilepticus increased throughout the United States after the publication of RAMPART. The associated decrease in rates of rescue therapy and invasive airway procedures confirm the clinical trial finding that midazolam is at least as safe and effective as other benzodiazepines for pre-hospital seizure treatment. Three years after dissemination of results in a high impact journal, there is substantial, but incomplete, clinical translation in pre-hospital care.

28 The Association of CT Findings with Repeated Measurements of Serum Biomarker Levels in Patients with Acute Mild to Moderate Traumatic Brain Injury

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Background: Prior studies suggest that serum Glial Fibrillary Acidic Protein (GFAP), Ubiquitin Carboxyl-Terminal Hydrolase-L1 (UCH-L1), and S100B may be useful screening tools to aid clinicians in reducing head computed tomography (CT) use for patients with mild/moderate traumatic brain injury (mmTBI). There is, however, little evidence for the diagnostic and therapeutic implications of monitoring these biomarkers over time.

Objectives: The aim of this study was to evaluate the association of CT findings with repeated biomarker level measurements and to assess potential clinical application of these biomarkers in the acute post-injury phase.

Methods: This prospective multi-center observational study included patients with mmTBI (Glasgow Coma Scale [GCS] 9-15) treated within 4 hours of injury. Serum samples (GFAP, UCH-L1, and S100B) were obtained at 6 hour intervals (maximum 24 hours). Mixed effects linear models, (random slope and intercept) were developed that examined changes in serum biomarker levels over time. The main predictors were CT result and the interaction of CT result with the time sample was obtained (other predictors; gender and GCS).

Results: 264 patients were enrolled; 61.0% were male, 235 (89.0%) had a presenting GCS of 15, and 39 (14.8%) had a positive head CT (Table). The figure shows GFAP levels by subject and LOESS plots (95% confidence limits) of values stratified by CT result. All three biomarker values were higher among CT positive patients ($p<0.001$) but GFAP was the only biomarker that significantly increased over time among CT positive patients relative to CT negative patients (estimated increase of 23.6 pg/mL/hour, $p=0.004$) where the same interaction for UCH-L1 and S100B were not significant ($p=0.41$ and $p=0.58$ respectively).

Conclusion: These results suggest that serum levels of all biomarkers were persistently higher among mmTBI patients with positive CT scans but only GFAP continued to significantly rise over time among CT positive compared to CT negative patients. Further studies are needed to elucidate the clinical implications of these findings related to patient monitoring and outcomes.

Table 1. Patient Characteristics

	CT Negative 85.2% (total n=225)	CT Positive 14.8% (total n=39)
Age (mean ± s.d.)	44.7 ± 17.6	54.9 ± 16.8
Gender		
Male	59.1% (133)	71.8% (28)
Race		
White	65.8% (148)	92.3% (36)
Employment Status (n=256)		
Employed	48.9% (107)	40.5% (15)
Alcohol		
Yes	24.4% (55)	33.3% (13)
Drugs		
Yes	14.7% (33)	5.1% (2)
Smoke		
Yes	31.6% (71)	30.8% (12)
Mechanism of Injury		
MVC	38.7% (87)	17.95% (7)
Fall (n=263)	50.45% (113)	76.92% (30)
Loss of Consciousness (LOC)		
Yes	63.6% (143)	74.4% (29)
GCS		
15	92.9% (209)	66.7% (26)
14	5.3% (12)	17.95% (7)
13	0.89% (2)	10.3% (4)
9 to 12	0.89% (2)	5.1% (2)
Initial Biomarker Values (pg/mL) (median; 25th, 75th)		
GFAP	8.0 (22.7, 2.6)	116.0 (437.5, 20.3)
UCH-L1	56.2 (103.8, 24.0)	132.6 (303.0, 98.1)
S100B (n=238)	110 (190, 70)	210 (400,160)

Table 28: Welch.

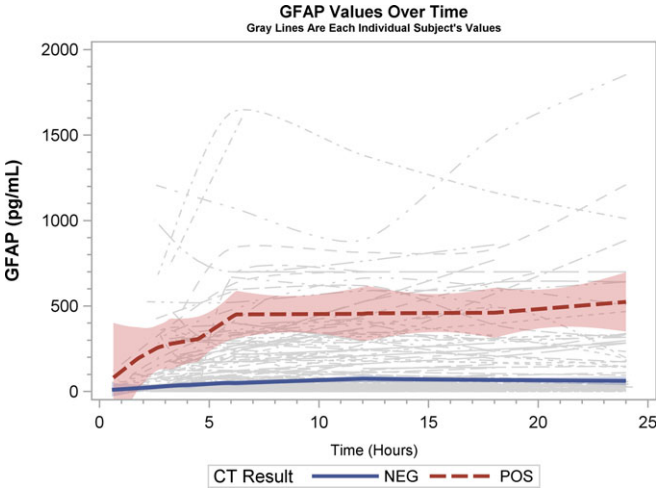

Figure 28 – Welch

29 Factors Associated with Discharge Home After Interhospital ED to ED Transfer for Trauma

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Background: Traumatic injury is commonly transferred to a higher level of care. Most trauma transfers arrive to the ED of the second hospital. A high proportion of these transfers result in discharge home representing an opportunity to improve patient-centered outcomes and reduce inefficient care.

Objectives: We determined factors associated with discharge home after ED to ED transfer for traumatic injury. We hypothesized that children and the uninsured would be most likely to be discharged home after transfer.

Significant Factors on Multivariable Analysis Associated with Discharge Home after Trauma Transfer

Characteristic	Odds Ratio	95% Confidence Interval
Age 65+	0.38	0.34-0.41
Female	1.34	1.27-1.41
Black	1.21	1.10-1.34
Hispanic	1.16	1.04-1.29
Medicaid	1.69	1.56-1.83
Uninsured	1.66	1.53-1.80
More chronic comorbid conditions	0.82 (per condition)	0.80-0.85
Higher Injury Severity Scale	0.98 (per point)	0.98-0.98
Severe Head Injury	0.14	0.12-0.16

Median total charges for the ED visit at the first hospital were $1,523 (IQR 739-3137), and $1,568 (IQR 813-3185) at the second hospital for patients discharged after transfer.

Table 29: Medford-Davis.

Methods: We analyzed all patients with injury diagnosis codes transferred from a non-trauma center ED to another ED in the 2011 Healthcare Utilization Project State Emergency Department and State Inpatient Databases for 6 states (MA, NY, FL, IA, UT, CA). We obtained hospital characteristics from American Hospital Association Annual Survey. The primary outcome was discharge home vs admission at the second hospital. Hierarchical logistic regression clustered by first hospital and adjusted by state was performed using independent variables selected for clinical plausibility. Variables included age, sex, race, insurance status, number of comorbidities, injury severity score, mechanism of injury, and transferring hospital characteristics. We report adjusted odds ratios significant to $p<0.05$.

Results: After excluding patients who initially presented to a level 1 or 2 trauma center, died in the second ED, or were discharged to a nursing/rehab facility, there were 42,094 encounters of which 56% were discharged home from the second ED. Discharge home following transfer was more likely in the elderly, females, Blacks or Hispanics, and patients with Medicaid or uninsured, but less likely in those with more comorbid chronic illnesses or more severe injury.

Conclusion: A significant proportion of those transferred for traumatic injury are discharged home from the ED after transfer. Elderly, minority, and underinsured patients are at highest risk. Costs may be doubled at the second hospital for these patients. Further work is needed to determine whether some of these transfers could be avoided with interventions such as telemedicine.

30 A Randomized Controlled Trial of the FAST Examination in Children with Blunt Torso Trauma

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Background: It is unclear if the focused assessment sonography for trauma (FAST) exam should be routinely used in injured children.

Objectives: To determine if the FAST performed in the ED during initial evaluation of children with blunt torso trauma would safely decrease abdominal CT use.

Methods: We conducted a single-center, unblinded superiority randomized controlled trial (NCT01540318) of hemodynamically stable children (<18 years) with blunt torso trauma. We randomized children shortly after arrival via a 1:1 computer-generated blocked, concealed sequence stratified by age group to undergo either FAST exam by the treating ED physician or no FAST exam. Other aspects of care were not directed by study protocol. The primary outcome was use of abdominal CT in the ED. Secondary outcomes were missed intra-abdominal injuries (IAIs), ED length of stay (LOS), time to abdominal CT, and clinician suspicion of IAI before and after FAST.

Results: 460 FAST and 465 no FAST subjects were enrolled; all were analyzed. The mean age was 9.7 ± 5.3 years and 575 (62%) were male, without significant differences in these or other baseline characteristics by study arm. 50 (5.4%) ultimately had IAIs diagnosed. 241 FAST (52.4%) and 254 no FAST subjects (54.6%) underwent abdominal CT (RR 0.96, 95% CI 0.85-1.08). One missed diagnosis (diagnosed after ED discharge) of a patient with a liver injury occurred in the FAST arm and none in the no FAST arm. In the FAST and no FAST arms, respectively, mean time to CT was 2.67 and 2.54 hours, (difference 0.13 hours, 95% CI -0.18 to 0.43 hours), and ED LOS was 6.03 and 6.07 hours (difference -0.03 hours, 95% CI -0.47 to 0.40 hours). Clinician suspicion of IAI was very low (<1% likelihood) in 105/458 subjects prior to FAST (23%, 95% CI 19%-27%) and 173/454 subjects after FAST (38%, 95% CI 34-43%) (difference 15%, 95% CI 9-21%).

Conclusion: The use of the FAST exam in the evaluation of hemodynamically-stable children with blunt torso trauma did not decrease the rate of CT use compared to controls. The use of the FAST exam, however, significantly decreased clinicians' suspicions of IAI in injured children, although this decreased suspicion did not translate into decreased CT use or ED LOS. Future research on safely decreasing abdominal CT use in pediatric trauma should focus on how physicians interpret and apply FAST results.

31 Facilities and Operational Characteristics of U.S. Freestanding EDs: Results of a National Survey

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Background: Freestanding EDs (FSED) provide emergency care remote from an acute care hospital. The number of FSEDs has increased rapidly, yet there is not national data on FSEDs.

Objectives: We aimed to determine the facilities, policies, staffing, and volume of FSEDs in the U.S.

Methods: We conducted a survey of U.S. FSEDs in 2015. The instrument was developed by content experts in EM and health policy, and revised based on a 4 site pilot. The sample frame was a national inventory of FSEDs (N=345). We divided states into 3 strata: 22 states with <6 FSEDs, 6 states with 9-33 FSEDs, and Texas (170 FSEDs). We sampled 245 FSEDs. We mailed surveys to the medical director, business or operations managers up to 4 times and phoned or emailed non-respondents. We calculated nationally representative estimates accounting for sampling and differential non-response across strata.

U.S. Freestanding ED Facility Operational Characteristics

	Unadjusted Result (% or median [IQR])	Weighted National Estimate (% or mean)	States with <6 FSEDs (% or median)	States with 9-33 FSEDs (% or median)	Texas (% or median)
Average Number of Private Rooms	10 [7, 13]	10.02	12	12	7*
Annual Patient Volume	12,742 [3,728, 20,226]	13,102	17,849	16,970	6,440*
Disposition: % Discharged	92.8% [90, 95]	91.9%	92.6%	92.5%	93.4%
Disposition: % Transferred or Admitted	5.5% [3.99, 7.08]	6.5%	6.4%	5.5%	5.1%
% Receiving ambulances	61.5%	53.3%	91.1%	81.0%	23.2%*
% Following EMTALA Standards	95.1%	94.9%	95.6%	97.6%	92.9%
% Not Participating in Medicare	29.2%	37.1%	0%	8%	58.9%*
% Not Participating in Medicaid	37.1%	47.0%	0%	8%	80.4%*
% Charging Facility Fee	93.0%	93.3%	91.1%	95.2%	92.9%

Table 31: Schuur.

We imputed ED volume for non-respondents based on strata, # of treatment spaces, avg. door-to-provider time, attending hrs, presence of trauma transfer agreement, and receiving ambulances. We used tests for equality of means and proportions to compare results for Texas relative to the rest of the states.

Results: We received a 60% (147/245) response rate overall; 73.9% (48/65) for states with a <6 FSEDs, 54.4% (43/79) for states with 9-33 FSEDs, and 55.4% (56/101) for Texas. 75.0% of FSED visits are by adults, and 24.7% are pediatric (age <18). 2.3% of visits were characterized as severity (ESI) level I/II, 45.5% as III and 52.5% as IV/V. 82.9% reported the having a board certified emergency physician at all hours of operation. 63.1% utilized physician's assistants or nurse practitioners. The table shows ED size, volume, disposition, ambulance and reimbursement policies; * for p<.05 for TX vs. other states. FSEDs in Texas are smaller, see a lower volume of patients, are less likely to receive ambulances, and are less likely to accept public insurance than FSEDs in other states (p<0.01). Non-hospital-affiliated FSEDs showed similar patterns compared to hospital affiliated FSEDs (p<0.01).

Conclusion: We see two general models of FSEDs: 1) larger, hospital-affiliated FSED which are more likely to accept ambulances and public insurance, and 2) smaller, independent, for-profit FSEDs which are more prevalent in Texas.

32 State Regulations of Freestanding Emergency Departments Vary Widely

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Background: The number of freestanding EDs (FSEDs) has increased rapidly in the U.S.

Objectives: To describe state regulations affecting FSEDs and to determine whether a state requirement for a certificate of need (CON) is associated with fewer FSEDs.

Methods: State regulations affecting FSEDs were identified by contacting state health officials and by searches on the internet and Westlaw Next. Regulations were reviewed by two trained reviewers using a standardized data abstraction form developed with input from a lawyer and two health policy experts. We looked at salient aspects of the licensing requirements, operating hours, staffing models, and minimum services required of FSEDs. We compared the number of FSEDs in states with CON to states without CON using a t-test.

Results: We identified 33 states with FSEDS, 17 (51%) of which have specific policy requirements for FSEDs and 16 (48%) states that require satellite EDs to follow hospital-based ED requirements. Table 1 details state policy requirements for FSEDs. 2 of the 33 (6%) states with FSEDs limit FSEDs to areas with <50,000 people. 15 (45%) states specify that FSEDs must be sited at least a minimum distance from a hospital. 23 (46%) states require a CON, 14 (42%) of which have FSEDs. States with CON requirements have significantly fewer FSEDs per 1 million population than states without CON (0.47 vs. 1.41, p=0.03). 14 (28%) states restrict the type of legal entities that may own and operate health care facilities, specifically restricting corporate practice of medicine. 24 (72%) states have EMTALA-like requirements including: 23 (69%) requiring FSEDs to perform emergency treatment and stabilization, and 24 (72%) requiring transfer abilities for further care. Texas, the state with the most FSEDs, has no CON or ownership requirements. In comparison, California law requires EDs to have on-site access to hospital services, effectively precluding FSEDS.

Conclusion: Variation among states' regulations regarding the licensure requirements, levels of staffing, and types of services provided at FSEDs creates a potential gap between patients' expectations and the clinical capabilities of FSEDs. This may create misperceptions for patients choosing the most appropriate site for acute medical care.

State Policies Affecting Freestanding EDs

Operational Requirements	% of states with regulation (n=33)
State-issued license required to open FSED	33%
Must be open 24/7	66%
Written transfer agreement with nearby hospitals	75%
Cardiac defibrillator on-site	42%
Mechanical ventilation on-site	18%
Physician on-site during all hours of operation	42%
Physician must be board-certified in Emergency Medicine	36%
Nurse on-site during all hours of operation	67%
Nurse certified in ACLS and/or PALS	27%

Table 32: Gutierrez.

33 Opioid Prescriptions by Emergency Physicians in Ohio, 2010 to 2014

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[1]Brigham and Women's Hospital, Boston, MA; [2]Swedish Medical Center, Seattle, WA; [3]State of Ohio Board of Pharmacy, Columbus, OH

Background: The opioid abuse and overdose epidemic in the US has led to scrutiny of opioid prescribing behavior and creation of policies and guidelines. Prescription drug monitoring programs (PDMPs) are databases that contain all of the scheduled medication prescriptions filled in the state, regardless of payer or pharmacy. Ohio's PDMP includes prescriber specialty type.

Objectives: To determine the trends and characteristics of opioid prescriptions by emergency physicians (EPs) in Ohio.

Methods: We analyzed prescriptions from 1/1/2010 to 12/31/2014 in the Ohio PDMP. Prescriptions for pill forms of hydrocodone, oxycodone, tramadol, codeine and hydromorphone written by physicians with a primary specialty of EM, pediatric EM or sports medicine (EM) were included. Prescriptions with quantity <4 or ≥99 (or non-integers), day supply ≤0 or >90, and patient age <5 or >99 years were excluded to remove possibly erroneous data. Descriptive statistics were generated.

Results: Overall, there were 2,791,632 prescriptions for these opioids by 1,855 EPs in Ohio from 2010-2014 (average 301 prescriptions/ physician/year). Numbers of prescriptions steadily declined each year, from 682,719 in 2010 to 413,876 in 2014 (-49.0%). More prescriptions were for women (1,603,444, 57.4%) than men. Mean patient age was 40.8 (SD 16.6). 265,949 prescriptions (9.5%) were for patients aged ≥65. Opioids prescribed were hydrocodone (53.1%), oxycodone (28.4%), tramadol (13.5%), codeine (4.6%) and hydromorphone (0.3%). Median pill count per prescription was 20 (IQR 12-20) and median morphine milligram equivalents (MMEs) in the prescription were 100 (IQR 75-125). 12,639 prescriptions (0.04%) were for extended release formulations.

Conclusion: Opioid prescriptions by EPs are for small numbers of pills, small MMEs per prescription, uncommonly to elderly patients, and very rarely for extended release formulations. Opioid prescribing by EPs has decreased significantly during the study period. These findings imply that initiatives that attempt to reduce opioid prescribing by EPs are working.

34 Emergency Departments Demonstrate Large Provider and Facility Variation in Opioid Prescriptions for Discharged Patients

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Background: There has been a dramatic increase in the number of opioids prescribed in emergency departments (ED) and filled by U.S. pharmacies over the past decade. However, understanding of physician, and facility variation in opioid prescribing from the ED is limited.

Objectives: To describe the variation in opioid prescribing for patients discharged from the ED at the physician-, and facility- level.

Methods: Using a secondary dataset from Emergency Medicine Business Intelligence (EMBI), we conducted a retrospective cohort study of ED visits from five geographically disparate U.S. hospitals from January to May 2014. We examined physician-level and facility-level variation in rates of opioid prescriptions using descriptive statistics.

Results: We studied 47,535 discharged ED visits treated by 253 ED attending physicians with at least 50 discharges across the 5 EDs. Median age was 40 (IQR 28, 55) years old, 61% were female, and 85% had insurance. Across all 5 EDs, there were 17,197 (36.2%) ED visits where opioids were prescribed and 1,974 (11.5%) ED visits receiving at least two opioid prescriptions at discharge. At the facility level, opioid prescribing rates ranged from 24.1% to 46.9% of discharged ED visits. At the individual ED physician level, opioid prescription rates ranged from 10% to 79.6% of discharged patients visits (IQR 26.6% and 43.9%). The corresponding mean, standard deviation, and coefficient of variation for the five EDs are as follows: Facility 1 (24.4%, 0.07, 3.44), Facility 2 (47.4%, 0.10, 4.74), Facility 3 (30.5%, 0.09, 3.58), Facility 4 (41.9%, 0.12, 3.36), and Facility 5 (37.3%, 0.06, 6.28). A histogram of the physician rate of opioid prescriptions at ED discharge by facility can be seen in the Figure.

Conclusion: We found substantial physician and facility variation in opioid prescription for discharged ED patients. Understanding factors that influence physician, and inter-facility facility variation in opioid prescription are needed considering the recent rises in ED prescriptions for opioids that have coincided with large increases in opioid-related deaths in the U.S.

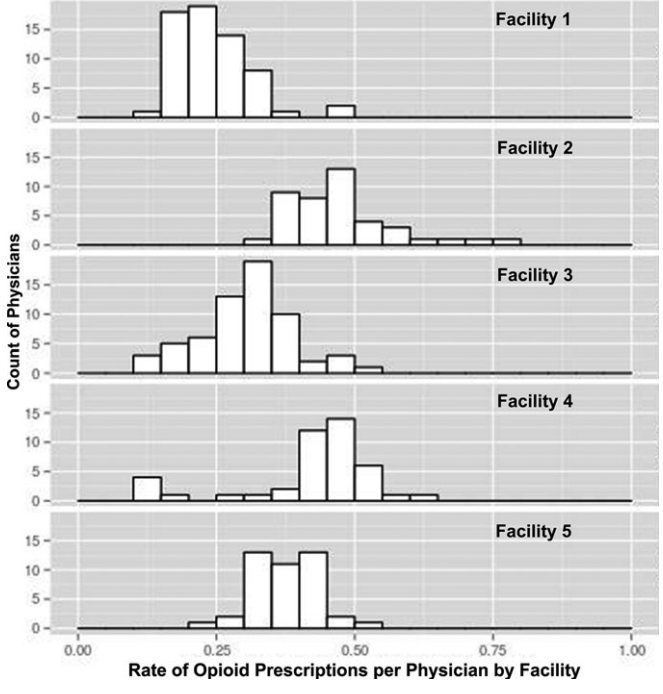

Figure 34 – Ward

35 The Clear Trials: A Pooled Analysis of rt-PA Plus Eptifibatide for Treatment of Acute Ischemic Stroke

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[1]University of Cincinnati College of Medicine, Cincinnati, OH; [2]Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background: The Combined Approach to Lysis Utilizing Eptifibatide and rt-PA in Acute Ischemic Stroke (CLEAR), CLEAR-Enhanced Regimen (CLEAR-ER) and CLEAR-Full Dose Regimen (CLEAR-FDR) trials were phase 2 trials that examined escalating doses of recombinant tissue-type plasminogen activator (rt-PA) combined with eptifibatide in acute ischemic stroke (AIS). We pooled data from these trials and compared outcomes of the escalating doses of rt-PA plus eptifibatide to rt-PA alone.

Objectives: To complete a pooled analysis on three clinical trials previously conducted to test for safety. To verify if a phase 3 efficacy trial would be appropriate.

Methods: The combination arms of the CLEAR trial were: tier 1 - 0.3mg/kg of rt-PA and tier 2 - 0.45mg/kg both combined with eptifibatide 75mcg/kg bolus and 0.75mcg/kg/min for 2 hours. CLEAR-ER combined 0.6mg/kg of rt-PA and 135mcg/kg bolus of eptifibatide and 0.75mcg/kg/min for 2 hours. CLEAR-FDR combined full dose rt-PA (0.9mg/kg) and 135mcg/kg bolus of eptifibatide and 0.75mcg/kg/min for 2 hours. The control groups for both CLEAR and CLEAR-ER received

Patient Characteristics and Outcomes in the CLEAR Trials

	CLEARtier 1 (n=29)	CLEARtier 2 (n=40)	CLEAR-ER (n=101)	CLEAR-FDR (n=27)	Controls (n=50)
rt-PAdose	0.3mg/kg	0.45mg/kg	0.6mg/kg	0.9mg/kg	0.9mg/kg
Eptifibatidebolus*	75mcg/kg	75mcg/kg	135mcg/kg	135mcg/kg	
Outcome					
mRS 0-1 or return to base, OR (95%CI)	0.97 (0.31, 3.03)	0.71 (0.26, 1.94)	1.26 (0.57, 2.79)	2.94 (0.96, 8.97)	Ref
Characteristics					
Age (years), median (IQR)	73 (67-77)	68 (52-77)	72 (58-82)	73 (65-81)	70 (56-79)
NIHSS, median (IQR)	14 (10-20)	14 (8-17)	12 (9-20)	12 (9-16)	12 (8-18)
Time to treatment (mins), median (IQR)	152 (130-167)	148 (135-170)	113 (99-135)	118 (98-151)	143 (120-164)
sICH#,N (%)	1 (3%)	0	2 (2%)	1 (3.7%)	5 (10%)

Table 35: Cornwall.

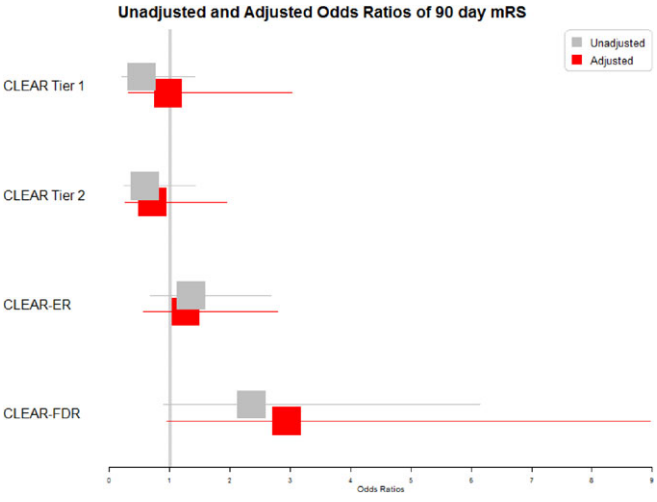

Figure 35 – Cornwall

full dose rt-PA only. The primary outcome was 90-day modified Rankin score (mRS) of 0-1 or return to baseline. Logistic regression was used for the analysis.

Results: A total of 247 subjects were available for analysis; 69 from the combination arm of CLEAR (29 in tier 1 and 40 in tier 2), 101 from the combination arm of CLEAR-ER, and 27 from CLEAR-FDR. Fifty rt-PA only subjects (25 from CLEAR and 25 from CLEAR-ER) served as controls. Characteristics and outcomes adjusted for age, sex, race, NIHSS and time to IV rt-PA are shown in the Table.

Conclusion: In the CLEAR trials, eptifibatide added to rt-PA showed a progressive increase in odds of a favorable outcome, without safety concerns. A phase 3 trial of full dose rt-PA plus the eptifibatide dose in CLEAR-ER and CLEAR-FDR is warranted to establish the efficacy of the combination for improving AIS outcome.

36 Efficacy of Tranexemic Acid at a Wide Range of Concentrations in the Setting of Tissue Plasminogen Activator Induced Hyperfibrinolysis

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Background: Intravenous tranexamic acid (TxA) is gaining credibility as a hemostatic agent in the setting of uncontrolled bleeding, including after therapeutic administration of tPA. Tranexamic acid interacts with kringles on plasmin and produces a biphasic effect whereby at low micromolar concentrations of tranexamic acid can increase plasmin-induced clot lysis by allowing favorable conformational change in plasmin tertiary structure, whereas at millimolar concentrations, tranexamic acid acts primarily by inhibiting its binding to fibrin. Therapeutic doses of tranexamic acid (e.g, 10 mg/kg) produce micromolar concentrations in human plasma.

Objectives: Using an in-vitro dynamic flow model of clot lysis efficacy, we test the dose response effect of a wide range of tranexamic acid concentrations on clot lysis stimulated by tPA on human blood.

Methods: We created a continuous flow model that pumps recirculating citrated human plasma (25 mL at 37°C) through chamber that contains 0.8-1.0 g of type matched clotted human blood. In separate experiments performed in triplicate, clots were exposed to one hour of circulation with either the vehicle (plasma without tranexamic acid and without tPA) or 100 μg of tPA with no tranexamic acid, or 100 μg of tPA with five concentrations of tranexamic acid (4 pM-100 μM). The main measurement was percentage clot lysis.

Results: The figure shows that tranexamic acid produced either no inhibition or inhibition of tPA catalyzed lysis, and at no concentration did tranexamic acid increase lysis (see "Patel Figure 1"). Tranexamic acid produced 50% inhibition in clot lysis at concentrations between 1-10 μM.

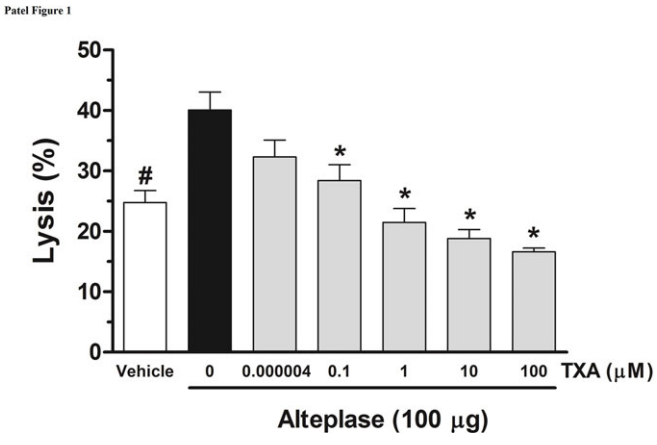

Figure 36 – Patel

Conclusion: These in-vitro data support the in-vivo safety of tranexamic acid in terms of showing no evidence of increased clot lysis at low concentrations, and clear evidence of clot lysis inhibition at therapeutically relevant concentrations. These data suggest potential therapeutic benefit for tranexamic acid to reduce clot lysis, and possibly bleeding, associated with hyperfibrinolytic conditions, such as bleeding after tPA administration to treat stroke or pulmonary embolism.

37 The Association of Blood Pressure Changes During the First 24 Hours Post-Acute Ischemic Stroke with 90-Day Functional Outcomes

Robert D. Welch[1], Valerie H. Mika[1], Morgan M. Ellis[1], Claire Pearson[1], Syed Imran Ayaz[1], Robert A. Swor[2], and Phillip D. Levy[1]
[1]Wayne State University/Detroit Medical Center, Detroit, MI; [2]William Beaumont Hospital, Royal Oak, MI

Background: There is uncertainty regarding early blood pressure (BP) reduction and outcome in acute ischemic stroke (AIS) and the 2013 American Stroke Association guideline-based recommendation that BP only be lowered during the initial 24 hours when it exceeds 220/120 mm Hg rests largely on level C evidence.

Table 1. Patient Characteristics*

	Good (N=371)	Not Good (N=470)	Total (n=841)
Age (mean [SD])	63.0 (13.4)	65.0 (12.5)	64.1 (12.9)
Gender			
Male	216 (58.2)	239 (50.9)	455 (54.1)
Female	155 (41.8)	231 (49.2)	386 (45.9)
Race			
African American	57 (15.4)	98 (20.9)	155 (18.4)
White	291 (78.4)	328 (69.8)	619 (73.6)
Other	23 (6.2)	44 (9.4)	67 (8.0)
Baseline NIHSS (median [25th, 75th])	9 (7, 13)	14 (9, 19)	11 (8, 17)
Vitals (mean [sd])			
Systolic Blood Pressure (mmHg)	157 (28.9)	155 (28.9)	156 (28.9)
Diastolic Blood Pressure(mmHg)	86 (17.2)	86 (19.9)	86 (18.8)
Pulse (Beats/Min)	80 (17.8)	83 (18.3)	82 (18.1)
Respiratory Rate (Breaths/Min)	18 (3.1)	18 (3.1)	18 (3.1)
SaO2 (%)	98 (2.2)	98 (2.2)	98 (2.2)
Hx Hypertension	247 (66.6)	352 (74.9)	599 (71.2)
Hx Diabetes Mellitus	67 (18.1)	105 (22.3)	172 (20.5)
Hx Renal Disease	18 (4.9)	35 (7.5)	53 6.3)

* Number (%) unless otherwise indicated

Table 37: Welch.

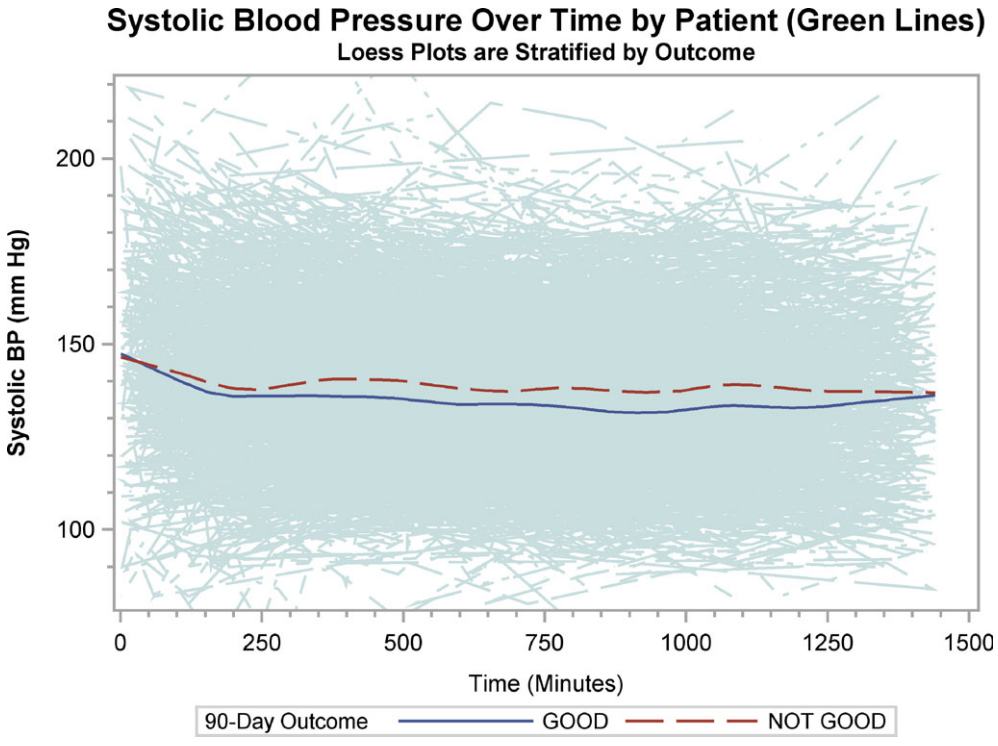

Figure 37 – Welch

Objectives: The aim of this study was to evaluate the association of outcome with BP changes over the first 24 hours in patients with AIS.

Methods: This secondary analysis of a multi-center prospective study (ALIAS; the Albumin in Acute Stroke Trial) included patients with AIS that presented to the emergency department within 5 hours of symptom onset. Subjects were randomized to receive either intravenous albumin (study drug) or saline. A favorable primary outcome was defined as a modified Rankin Scale of 0 or 1 or an NIH stroke scale (NIHSS) of 0 or 1 at 90 days. Vital signs were obtained every 6 hours (to day 7 or discharge). A general estimating equation (repeated measures) was fit to determine the association of blood pressure during the first 24 hours of hospitalization with patient outcome (adjusted for treatment, age, gender, baseline NIHSS, stroke classification and pulse).

Results: 841 subjects were enrolled (4561 blood pressure measurements); 52.7% were male, mean age (SD) was 64.1 (12.9) years, 73.6% were white, 71.2% had a history of hypertension, baseline systolic BP was 156 (29) mm Hg, and 371 patients (44.1%) had a favorable primary outcome. Presenting vital signs were similar between groups but the median NIHSS was lower in those with a favorable outcome (Table). While BP curves appear divergent (Figure), the adjusted odds of a favorable outcome for each 5 mm Hg increase in systolic BP was 0.97 (95% CI; 0.95-1.00; p=0.051) and for diastolic BP was 1.03 (0.98-1.08; p=0.24).

Conclusion: Blood pressure, during the first 24 hours post-AIS, was not associated with clinical outcome. Prospective controlled studies are needed to define optimal vital sign targets in AIS patients.

38 Patient and Environmental Factors Associated with Delayed Presentations to Emergency Department After Onset of Stroke Symptoms

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Background: Cerebrovascular disease is the fourth leading cause of death in the US. For patients who survive a stroke, daily functionality may be permanently affected. Systemic thrombolysis has the potential to improve morbidity in patients who present to an ED shortly after the onset of symptoms. Despite the significant morbidity and mortality from stroke, little is known about patient barriers to early presentations, which could result in the use of systemic thrombolysis to prevent morbidity.

Objectives: To identify patient and environmental factors associated with delayed presentations to the ED after onset of stroke symptoms.

Methods: We performed a multicenter study using structured chart abstraction methodology at 3 unique hospitals including: (1) urban county, (2) tertiary academic, and (3) rural community hospital. Consecutive patients ≥18 years of age were included if they were admitted to the hospital from the ED and the ED diagnosed or initiated treatment for an acute ischemic stroke. Patients were excluded if they were transferred from another hospital. The outcome measure, delayed presentation (> 3.5 hours) following stroke onset, was independently abstracted by blinded investigators.

Results: Among the 351 patients, 63% presented to the ED more than 3.5 hours after onset of stroke symptoms. Speaking a language other than English (Spanish: OR 3.3 (95% CI 1.2-8.9); Other: OR 9.1 (95% CI 1.2-71.0)) and living in a rural area (OR 2.2 (95% CI 1.2-4.2) were significantly associated with delayed presentation. Healthier patients without stroke related comorbidities (OR 0.3, 95% CI 0.1-0.8) and patients who presented in the evening (OR 0.45, 95% CI 0.3-0.8) were significantly less likely to have a delayed presentation. Age, gender, race/ethnicity, stroke symptom, and day of week were not significantly associated with delayed presentations following the onset of stroke symptoms.

Conclusion: Our results suggest that language and proximity to a hospital are strongly associated with delayed presentations to an ED following the onset of stroke symptoms. More surprising, however, is that 63% of patients in our cohort presented outside the window for thrombolysis. Increasing education to the public regarding stroke symptoms and the time sensitivity of treatment could make a significant impact on the public health burden related to stroke.

39 Antibiotic Stewardship of Acute Respiratory Infections in the Emergency Department

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Background: Acute respiratory infections are a common condition encountered in the ED. The vast majority of cases are viral. Antibiotics confer potential risks to patients, including diarrhea, yeast infections, allergic reactions and *C. difficile* colitis. Furthermore, inappropriate antibiotic use contributes to antibiotic resistance.

Objectives: We sought to evaluate the efficacy of a quality improvement initiative to decrease the rate of inappropriate antibiotic prescription to patients with acute respiratory infections.

Methods: A prospective observational study was performed, utilizing a chart review of patients presenting with acute respiratory infections to an urban, tertiary care, academic ED. Antibiotic prescription data was collected for adults with a diagnosis of cough, upper respiratory illness, acute bronchitis, or common cold from November 2013 to February 2014 (pre-intervention period) and from November 2014 to February 2015 (post-intervention period). The intervention involved providing educational materials to patients about antibiotic side-effects and monthly personalized physician feedback about prescribing habits. Patients with another diagnosis that warranted antibiotics as determined by investigator consensus were considered appropriate. We measured the change in rates of antibiotic prescription between study periods.

Results: A total of 2276 patients were included, with 1040 (46%) categorized as pre-intervention and 1236 (54%) post-intervention. Pre-intervention, 226 (22%) patients were prescribed antibiotics compared to 167 (14%) post-intervention. A significant change ($X^2(1)=26.7$, $p<0.0001$) was found in antibiotic prescription rates before and after the intervention. A two-tailed, paired t-test revealed a significant reduction in the rate of antibiotic prescription ($t(35)=2.28$, $p=0.03$) with a 5.3% (95%CI 0.7-9.9%) reduction post-intervention. The odds of inappropriate antibiotic prescription were almost twice as likely (OR 1.8, 95%CI 1.4-2.2) before intervention ($p<0.0001$).

Conclusion: This low cost intervention, which was aimed at educating patients and making providers more aware of their prescribing habits, may decrease inappropriate prescriptions for acute respiratory infections in the ED, leading to fewer antibiotic-related side effects and resistance.

40 CURB-65 Performance Among Admitted and Discharged Emergency Department Patients with Community Acquired Pneumonia

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Background: Pneumonia severity tools were primarily developed in cohorts of hospitalized patients, limiting their applicability to emergency department (ED) disposition decisions.

Objectives: We describe current community ED admission practices and examine the accuracy of the CURB-65 to predict 30-day mortality for patients, either discharged or admitted with, community acquired pneumonia (CAP).

Methods: A retrospective, observational study of adult CAP encounters in 14 community EDs within an integrated health care system. We calculated CURB-65 scores for all encounters and described the use of hospitalization, stratified by each score (0-5). We then used each score as a cut-off to calculate sensitivity, specificity, positive predictive value, negative predictive value (NPV), positive likelihood ratios and negative likelihood ratios for predicting 30-day mortality.

Results: The sample included 21,183 ED encounters for CAP (7,952 discharged and 13,231 admitted). The C-statistic describing the accuracy of CURB-65 for predicting 30-day mortality in the full sample was 0.761 (95% CI, 0.747-0.774). Among patients discharged from the ED, the C-statistic was higher (0.864, 95% CI, 0.821-0.906) than for those admitted from the ED (0.689, 95% CI, 0.672-0.705). Among all ED encounters a CURB-65 threshold ≥1 was 92.8%sensitive and 38.0% specific for predicting mortality, with a 99.0% NPV. Among all encounters, 62.5% were admitted, including 36.2% of those at lowest risk (CURB-65=0).

Conclusion: CURB-65 performs better in predicting 30-day mortality for patients discharged from the ED with CAP than in previous reports of hospitalized cohorts. This severity tool may help ED providers risk stratify patients to assist with disposition decisions and identify unwarranted variation in patient care.

Figure 1: Receiver operating characteristic (ROC) curves for CURB-65, assessing its ability to predict 30 day mortality in 3 groups of ED patients with community acquired pneumonia: patients not admitted to the hospital (outpatient), admitted/observed (inpatient) and all patients combined.

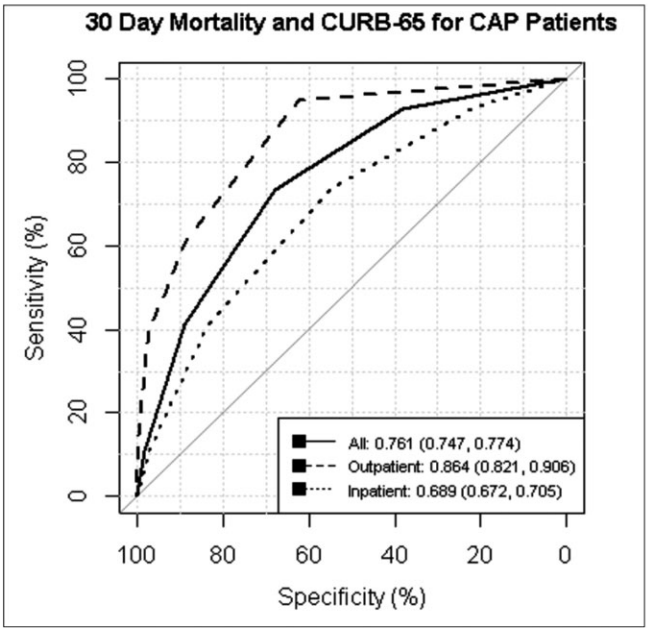

Figure 40 – Sharp

41 Cost-Effectiveness Analysis of Early Point-of-Care Lactate Testing in the Emergency Department

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Background: Early identification and treatment of patients with severe sepsis improves patient management. We examined whether

Variables that are key drivers of the preferred strategy.			
Variable	Usual Care Strategy Preferred	Cost-Effective Range for POC Lactate Program	Dominance Range of POC Lactate Program
Severe Sepsis Patients with Lactate ≥ 4mmol/L (%)	< 17.2%	17.2% – 36.0%	> 36%
ED Patients with Severe Sepsis (%)	< 0.6%	0.6% – 1.2%	> 1.2%
Number of Annual ED Visits	< 25,000	25,000 – 51,000	> 51,000
Mortality Reduction from POC Lactate Program	< 1.4%	1.4% – 10%	-
Fixed Costs POC of Lactate Program	> $42,000	$21,000 – $42,000	< $21,000
Variable Costs of POC Lactate Program	> $16	$8 – $16	-
Average ED Patient Age	> 84 years	40 – 84 years	-
ED Patients Severe Sepsis with High Lactate Clearance (%)	< 40%	40 – 90%	-
Cost of Admission to ICU with Survival	< $33,000	$33,000 – $60,000	-

Table 41: Ward.

implementing a Point-of-Care (POC) Lactate Program in the ED - with the goal of demonstrating that early identification and treatment of occult severe sepsis patients is a cost-effective intervention.

Objectives: Determine the cost-effectiveness of a POC Lactate Program in the ED.

Methods: We constructed a computer-based model to assess the cost-effectiveness of a POC Lactate Program compared to a Usual Care Strategy (UCS) in the ED. In the POC Lactate Program, patients with systemic inflammatory response syndrome (SIRS) and an infectious source are screened early in care through POC testing, specifically those with severe sepsis and an elevated lactate (≥4 mmol/L) are resuscitated in the ED, then lactate is measured again after resuscitation. Those who clear lactate are admitted to the hospital floor, while those with persistent lactate elevations are admitted to the intensive care unit (ICU). In the UCS, all severe sepsis patients with an elevated lactate are admitted to the ICU. Costs were estimated from 2014 Medicare Fee schedules, and hospital and industry estimates. Cost-effectiveness was defined as being lower than the willingness-to-pay threshold of $50,000 per quality-adjusted-life year (QALY).

Results: In the base-case, an ED with 30,000 visits per year had 207 severe sepsis patients, of which 44 had a lactate level of ≥4 mmol/L. In the POC arm, 14/44 patients did not clear their lactate and were admitted to the ICU. The POC Program had an incremental cost-effectiveness ratio (ICER) of $33,318/QALY, well below the $50,000/QALY threshold. The POC Program cost $39.53 compared with the UCS with a cost of $33.20/patient. Patients in the POC arm had 9.3784 QALYs compared with 9.3782 for the UCS. The sensitivity analysis demonstrating thresholds at which the POC program was Dominant (i.e. cost less & better outcomes), Cost-effective (ICER $1-50,000/QALY), and the UCS was more cost-effective (ICER >$50,000/QALY) are displayed in the Table.

Conclusion: A POC Lactate Program for screening ED patients with SIRS to identify and treat severe sepsis early in care is a cost-effective ED intervention.

42 Utilization of Single Dose of Oral Prednisone in the Treatment of Cellulitis

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Background: Cellulitis resulted in about 30,000 deaths worldwide in 2013. The utilization ofsteroids in various infectious processes has come to light in recent years tofasten recovery, especially in pharyngitis. Information about the use of steroids in cellulitis is limited, however, promising; extended research in thisarea is warranted to prove significance.

Objectives: The hypothesis was that a single dose of a corticosteroid (prednisone) will result in reduction of pain and inflammation, and enhance patient recovery. Our primary objective was to show a pain reduction of 25 millimeters on a Visual Analog Scale (VAS) and a decrease in erythema size at 48 hours.

Methods: This was a prospective, double-blinded, placebo-controlled, randomized study conducted at an urban emergency department. Information recorded vital signs, measure of cellulitis area in millimeters (at least 50mm) in two directions of maximal erythema, and the initial pain score using the VAS. Antibiotic and pain control treatment were given as per standard protocol for cellulitis. Oral antibiotics and pain medications were used for subjects being discharged. All subjects were randomized and received a single dose of 60mg of prednisone or placebo. Subjects were asked to return in 48 hours for re-evaluation. The information collected included a VAS, measurement of the cellulitis area, any limitation in daily activity as a result of pain, quantity of pain medication used, as well as medical visits.

Results: Paired sample t-test was done to compare the decrease in VAS scores. The placebo group had a mean decrease of 31.5 mm ($p = 0.18$) and the prednisone group had a mean decrease of 43.5 mm ($p = 0.02$). Twenty-one subjects were analyzed. Eight subjects received placebo and thirteen subjects received prednisone. Both groups were similar in baseline characteristics. Paired sample t-test was done to compare the decrease in VAS scores. The placebo group had a mean decrease of 31.5 mm ($p = 0.18$) and the prednisone group had a mean decrease of 43.5 mm ($p = 0.02$).

Conclusion: In this limited study, the use of prednisone in patients with cellulitis proved to be beneficial in pain reduction at 48 hours.

43 Diagnosis of Pulmonary Embolism Using Tricuspid Annular Plane Systolic Excursion on Bedside Echocardiogram

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Background: Presence of right heart strain (RHS) on echocardiography has prognostic and therapeutic value in patients with pulmonary embolism (PE). Tricuspid annular plane systolic excursion (TAPSE) has been shown to be a reliable measure of RHS in patients with PE, but its use in the diagnosis of PE has not been investigated.

Objectives: We hypothesized that TAPSE would be more sensitive in the diagnosis of PE than other measures of RHS. We sought to determine the diagnostic test characteristics (sensitivity, specificity, and likelihood ratios) of TAPSE for PE and to compare them to other measures of RHS.

Methods: Prospective convenience sample study of patients undergoing CT arteriogram (CTA) for suspected PE in the ED. Patients underwent a bedside echocardiogram performed by one of 5 emergency physicians (EPs) with varying degrees of experience in bedside ultrasound. TAPSE was measured using M-mode in the apical four-chamber view. Additional signs of RHS that were assessed included increased right ventricular size as compared to the left (RV≥LV), septal flattening, McConnell's sign, and presence of tricuspid regurgitation (TR). A post-hoc subgroup analysis of patients with at

Diagnostic test characteristics of TAPSE compared to other markers of right heart strain for PE				
	Sensitivity % (95% CI)	Specificity % (95% CI)	+ Likelihood Ratio	− Likelihood Ratio
TAPSE	70 (49-84)	80 (70-87)	3.47	0.38
TAPSE (abnormal vitals)	100 (74 - 100)	70 (53-83)	3.30	0.00
RV≥LV 35 (95 19-47)	35 (95 19-47)	92 (95 84-97)	4.58	0.70
Septal Flattening	35 (95 19-47)	94 (95 86-97)	5.56	0.70
McConnell's Sign	17 (95 7-37)	99 (95 93-100)	13.70	0.83
Tricuspid Regurgitation	39 (95 22-59)	80 (95 70-87)	1.93	0.76

Table 43: Daley.

least one abnormal vital sign (oxygen saturation <95%, heart rate >100 BPM, and/or systolic BP <80) was performed. Diagnostic test characteristics were calculated by comparing echo data to a diagnostic gold standard of CTA. EPs were blinded to CTA results.

Results: There were 104 patients enrolled, of which 23 had a PE and 4 of these received thrombolysis. Mean TAPSE was 22mm (SD 4mm) and ranged from 9mm to 37mm. TAPSE was abnormal (<=17mm) in 22.1%. A ROC curve analysis determined the optimal test threshold for TAPSE in diagnosing PE to be 19mm with an AUC of 0.75. For diagnostic test characteristics, see Table 1.

Conclusion: TAPSE was significantly more sensitive in the diagnosis of PE than other measures of RHS on EP bedside echocardiogram, with an optimal cutoff of 19mm. Among patients with abnormal vitals signs, TAPSE was 100% sensitive for PE. This suggests that TAPSE may be particularly helpful in ruling out PE at the bedside of a critically ill patient, which we plan to investigate in subsequent research.

44 The Effect of Clinical Decision Support on the Use and Yield of Computed Tomography for Suspected Pulmonary Embolism in the Emergency Department: A Multi-Center Trial

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Background: Inappropriate imaging leads to higher costs, increased resource utilization, and patient exposure to radiation and contrast-related risks. Clinical decision rules have been validated for the evaluation of emergency department (ED) patients with suspected pulmonary embolism (PE). Evidence-based clinical decision support (CDS) has been shown to decrease the use of imaging not adherent to evidence-based guidelines.

Objectives: To determine the effect of evidence-based CDS on the use and yield of computed tomographic pulmonary angiography for suspected pulmonary embolism (CTPE) in ED patients. We hypothesized that CDS would result in increased yield and decreased utilization of CTPE.

Methods: This institutional review board-approved, multi-center prospective trial used a pre/post design. Setting: Three urban EDs with a shared electronic medical record (EMR) and computerized physician order entry (CPOE) system. Participants: ED patients aged 18 years or older with suspected PE. CTPE use and yield were compared before and after CDS implementation (19 months pre and 32 months post). Intervention: Evidence-based CDS, based on the Wells criteria, provided at the time of CTPE order, deployed in April 2012. Main Outcomes and Measures: The primary outcome was the yield (percentage of studies positive for acute PE) and secondary outcome was utilization (number of studies per 100 ED visits) of CTPE. Chi-square and statistical process control chart assessed pre- and post-intervention differences.

Results: Of 558,795 patients presenting over the 51-month study period (October 2010 through December 2014), 7,987 (1.4%) underwent CTPE (mean age 52 +/- 17.5 years, 66% female, 60.1% black); 34.7% of patients presented pre- and 65.3% post-CDS implementation. The overall CTPE yield was 9.8% (779/7,987 studies positive for PE). Yield increased a relative 30.8% after CDS implementation from 8.1% to 10.6% (p=0.0003). There was no statistically significant change in CTPE utilization (1.4% pre- vs. 1.4% post-CDS implementation; p=0.25). A statistical process control chart demonstrated immediate and sustained improvement in CTPE yield post CDS implementation.

Conclusion: The implementation of evidence-based CDS in the ED was associated with an immediate, significant and sustained increase in CTPE yield without a measurable decrease in CTPE utilization.

45 Inter-Observer Variability and Visual Estimation of Tricuspid Annular Plane Systolic Excursion in Patients with Suspected Pulmonary Embolism in the Emergency Department

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Background: An additional method for emergency physicians (EPs) to assess right heart strain (RHS) could be beneficial in the evaluation of ED patients with suspected pulmonary embolism (PE). Tricuspid annular plane systolic excursion (TAPSE) has been shown to be a reliable echocardiographic measure of RHS. The inter-rater reliability of TAPSE among EPs and the ability of EPs to visually estimate TAPSE has not been investigated.

Objectives: Goals of this study were to determine whether EPs could measure TAPSE with good inter-rater reliability and accurately visually estimate TAPSE in patients with suspected PE.

Methods: Prospective convenience sample study of ED patients undergoing CT scan for suspected PE. Eligible subjects had a bedside EP echocardiogram by one of 5 physicians with varying degrees of experience in bedside ultrasound. Two subgroups of patients were analyzed. In the first subgroup, patients underwent a repeat bedside echocardiogram for TAPSE by a second EP, blinded to the first

echocardiogram. In the second subgroup of patients, TAPSE was visually estimated as ≥17mm ("normal") or <17mm ("abnormal") prior to measurement, which was subsequently performed using M-mode in an apical four-chamber view. EPs were blinded to the patient's diagnosis. To determine inter-rater reliability, a one-way random intraclass correlation coefficient (ICC) was computed. The kappa statistic was calculated to determine agreement between visual estimation and the actual TAPSE measurement, which was classified as "abnormal" or normal".

Results: 104 subjects were enrolled. The first subgroup included 22 subjects with repeat TAPSE measurements. The initial TAPSE measurement ranged from 9mm to 28mm with a mean of 20mm (SD 4mm). The ICC for measurement of TAPSE among EPs was 0.87 (95%CI 0.82-0.92). The second subgroup included 39 patients; 34 of whom EPs visually estimated TAPSE as "normal" and 5 as "abnormal". EPs correctly visually estimated TAPSE as "normal" or "abnormal" in all 39 subjects, yielding a kappa statistic of 1.0 (95%CI 0.92-1.0).

Conclusion: EPs are capable of measuring TAPSE with good inter-rater reliability. EPs can accurately visually estimate TAPSE as "normal" or "abnormal". Using TAPSE to assess for RHS in patients with suspected PE is within the scope of practice of EPs.

46 Radiation Dose Index for Pulmonary Embolism CT Exams in the United States

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Background: Pulmonary embolism (PE) is a common and potentially lethal disease for which enhanced multi-detector computed tomography (CT) is often used as a first-line modality for diagnosis.

Objectives: To determine the radiation dose indices for PE protocol CT (CTPE) studies performed in the U.S. and any institutional-level factors associated with higher dose index.

Methods: A retrospective analysis of CTPE exams was performed using the American College of Radiology Dose Index Registry which accumulates CT radiation dose index data from participating institutions and includes study type, institutional factors, and dose index. CT dose indices (estimated volume CT dose index [$CTDI_{vol}$], total dose-length product [DLP]) were evaluated from institutions that contributed data to the registry from a minimum of 10 exams from both adult and pediatric patients between January 1, 2012 and June 30, 2015. Dose indices were analyzed using descriptive statistics, and regression analysis was used to determine the relationship between dose index and institutional and patient factors.

Results: Of 257,400 CTPE exams from 374 facilities, the majority was performed on female patients (61%), at community hospitals (64%), and from a metropolitan area (63%). Pediatric patients accounted for 0.8% of the exams (1,962) with the majority in the 15-18 year age group. Over a quarter of the exams were performed in patients <45 years of age. Overall median $CTDI_{vol}$ was 15mGy (Interquartile Range [IQR]: 10mGy, 22mGy); median DLP was 435mGy-cm (IQR: 288mGy-cm, 638mGy-cm). There was wide variation in dose indices with all found to be higher in the facility categories of freestanding centers and multi-specialty clinics, in rural facility locations, and in male patients. In addition to children's hospitals, the lowest median $CTDI_{vol}$ and DLP were seen in the academic facility category (12mGy).

Conclusion: There is significant institutional variation in radiation dose index for PE protocol CT exams performed in the U.S. Future efforts are needed to standardize and optimize institutional CT practices and dose indices in order to minimize radiation exposure to patients with suspected PE.

47 Optimizing Clinical Decision Support in the Electronic Health Record: Clinical Characteristics Associated with the Use of a Decision Tool for Disposition of ED Patients with Pulmonary Embolism

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Background: Adoption of clinical decision support (CDS) tools by clinicians is often limited by workflow barriers.

Objectives: To assess characteristics associated with clinician use of an electronic-health record-embedded CDS tool for site of care disposition of ED patients with acute pulmonary embolism (PE).

Methods: In a prospective study on ED activation of a CDS tool across 14 hospitals within a large hospital system between 9/14-5/15, the CDS tool was deployed at 10 active sites that employed an on-site champion, education sessions, iterative feedback to clinicians on use of the tool and up to 3 gift cards/clinician as an incentive for CDS use. It was also deployed at 4 passive sites that received only an introductory educational session. Activation of the CDS tool - that calculated the Pulmonary Embolism Severity Index (PESI) score and provided assistive guidance - and associated clinical data were collected prospectively. Eligibility and missed activations were assessed through retrospective audits. We used bivariate comparisons and multivariable logistic regression to assess the association between appropriate activation of the CDS tool and characteristics at: 1) Patient level (ED PESI score), 2) Provider level (age, gender, and clinical load at time of activation opportunity) and 3) Hospital level (active vs. passive site, and facility ED volume and overall ED acuity at time of activation opportunity) with adjustment of standard errors for clustering at the facility level.

Results: Out of 613 eligible patient encounters, the CDS activation rate was 60%. At active sites, the tool was activated 67% of the time (346/514) and at passive sites 13% (20/150). In bivariate analysis, at active sites we observed an increase in activation rates based on the number of prior gift cards the treating physician had received (97% if 3 prior gift cards versus 59% if 0, $p<0.0001$). At passive sites, physicians < age 40 had higher rates of activation. In regression analysis, active site status (odds ratio [OR] 11.9, 95% CI 6.2, 22.7) and low ED volume at the time of PE diagnosis (OR 1.6, 95% CI 1.2, 2.2) were associated with higher likelihood of CDS activation.

Conclusion: We found that lower facility ED volume status and performing active on-site tool promotion significantly increased odds of CDS tool activation. Optimizing CDS adoption requires active education and minimizing clinical workflow disruptions.

48 Validation of a Prediction Rule for Adverse Cardiovascular Events from Drug Overdose

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Background: Adverse cardiovascular events (ACVE) complicate up to 16.9% of hospitalizations for acute drug overdose. We previously derived a risk prediction rule for ACVE in these patients with 97.1% negative predictive value.

Objectives: Our aim was to internally validate the ACVE rule test characteristics.

Methods: This prospective cohort study was conducted over 17 months (2012-14) at 2 urban teaching hospitals. Patients were adults with suspected acute drug overdose enrolled from the ED. The study outcome, ACVE, was defined as any of the following: myocardial injury (elevated troponin I), shock (requiring vasopressors), ventricular dysrhythmia (VT/VF/TdP), or cardiac arrest (pulseless requiring CPR).

The rule included any of these 3 factors: (1) prior cardiac disease (CAD or CHF); (2) QTc ≥ 500ms; (3) initial serum bicarbonate ≤ 20 mmol/L. Sample size was predetermined in order to produce test characteristics with 95% CI widths <5%; we calculated the need to analyze 900 patients.

Results: There were 1,457 patients screened, of whom 552 were excluded (185 non-drug overdose, 145 pediatrics, 111 missing data, 110 alternate diagnosis, 1 chronic), leaving 905 for analysis (mean age, 41 years; female, 44%; suicidal, 40%). ACVE occurred in 65 (7.2%, CI 5.6-9.1) patients (myocardial injury, 44; shock, 31; dysrhythmia, 16; cardiac arrests, 17) and there were 16 (1.8%, CI 0.9-2.6) deaths. The multivariable model adjusting for the previously derived risk factors, controlling for age, confirmed the following independent predictors of ACVE: QTc ≥500 msec (OR 5.5, CI 2.8-10.9), bicarbonate ≤20 mmol/L (OR 2.7, CI 1.5-4.9), and prior cardiac disease (OR 39.5, CI 17.9-87). The validated prediction rule had 75.4% (CI 63.1-85.2) sensitivity, 82.3% specificity (CI 79.9-85.1), and 97.8% negative predictive value (CI 96.4-98.7). The presence of 2 or more risk factors had 51.5% positive predictive value (CI 34.5-68.6).

Conclusion: The risk prediction rule for ACVE in patients with acute drug overdose performed with slightly improved sensitivity and negative predictive value in the validation cohort. External validation in distinct patient populations and clinical settings remains warranted.

49 Emergency Physician Adherence to Guideline-Based Therapy in a High Fidelity Simulation of Hypertensive Neurologic Emergencies

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Background: Neurologic emergencies are among the more devastating consequences of persistently elevated blood pressure (BP). While few studies compare the effectiveness of BP goals in the management of hypertensive neurological emergencies, treatment guidelines (Level B and C evidence) do exist.

Objectives: Using standardized, simulated case scenarios, we sought to identify emergency physician (EP) adherence to these guidelines.

Methods: Volunteer EPs were recruited during the 2015 American College of Emergency Physicians Research Forum. Participants provided demographic and practice setting information and were blinded to the study outcome. Participants were randomized to a live actor simulation of either acute ischemic or hemorrhagic stroke. A nurse narrator provided additional data including vital signs, CT of the brain, ECG, and lab results. The decision to treat or not-treat the patient's elevated BP, were recorded at critical branch points. Descriptive statistics were compiled and Chi square analysis of associations between stroke type, BP level and guideline-concordant therapy was performed.

Results: Eighty-six participants completed the simulation, and cases were randomized equally between ischemic and hemorrhagic stroke types. Demographic variables are summarized in the Table. There were no significant associations between any of the demographic or practice variables and adherence to guidelines. Overall, adherence to guideline-based therapy was high (73%). A significantly greater proportion of EPs (86% vs. 59%) correctly administered treatment when BP exceeded guideline-established thresholds rather than withholding treatment when it was not indicated (p = 0.011), suggesting a preference to treat (rather than not treat) with BP lowering medication in the setting of acute stroke. There was a trend toward more appropriate treatment for ischemic (79%) vs. hemorrhagic stroke (67%), but this did not achieve statistical significance (p= 0.130).

Conclusion: In this high fidelity simulation scenario of elevated BP in the setting of hemorrhagic or ischemic stroke, a high percentage of EPs followed treatment guidelines. Further research into variables influencing treatment patterns may inform efforts aimed at increasing guideline concordant therapy for hypertensive neurological emergencies.

Table: Demographic data for participants in high fidelity simulation of hypertensive emergencies (%; SD+/-).

Age	Gender	Level of Training	Board Certification	Duration Practice	Geographic Location	Practice Setting	Strokes Treated/Yr
<35,39 (44)	Male, 68 (76)	Attending, 61 (69)	Yes, 51 (58)	<5, 12 (14)	Urban, 70 (80)	Academic, 73 (83)	Ischemic, 40 (+/- 27)
35-50, 33(38)	Female, 20 (24)	Resident, 27 (31)	No, 37 (42)	5-10, 18 (20.5)	Suburban, 17 (19.3)	Community, 15 (17)	Hemorrhagic, 26 (+/- 24)
51-65, 13(15)				11-20, 17 (19.3)	Rural, 1 (1)		
>60, 3 (3)				>20, 14 (15.5) Missing, 27 (30.7)			

Table 49: Wilson.

50 Impact of Hospital Ownership and Expected Payer on Admission and Workup for Emergency Department Patients with Chest Pain

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Background: While there is concern that quality of care and access vary according to patient socioeconomic status, the role of other financial factors in the provision of care in the emergency department (ED) is not well understood.

Objectives: To investigate, among ED patients with chest pain, how rates of 1) hospital admission and 2) resource intense workup (RIW) vary according to hospital ownership and patient insurance (as defined by primary payer).

Methods: We conducted a retrospective cross-sectional analysis of the 2012 Nationwide Emergency Department Sample (NEDS). Because "chief complaint" is not captured in the dataset, diagnosis codes were used as a proxy. Patients with an ED diagnosis of acute myocardial infarction, coronary atherosclerosis, other heart disease, or nonspecific chest pain were included. Visits missing data were excluded. Transfer to outside hospital was counted as inpatient admission. RIW was defined as stress test, echocardiogram, CT or MRI of the chest, thrombolysis, angioplasty, or bypass surgery. Results are presented as adjusted values predicting the probability of the outcome variable using multinomial logistic regression with age, gender, region, hospital teaching status, month, and weekend arrival as other covariates.

Table 1A. Adjusted probability of inpatient admission according to hospital ownership and patient insurance status for patients with chest pain, NEDS sample, 2012

	Hospital Control		
Primary payer	Public	Private, non-profit	Private, for-profit
Medicare	13.7%	13.9%	16.3%
Medicaid	16.4%	17.7%	21.5%
Private	13.2%	11.8%	14.0%
Uninsured	11.9%	13.3%	14.7%

Table 1B. Adjusted probability of resource intense workup (in ED or as inpatient) for patients with chest pain, according to hospital ownership and patient insurance status, NEDS sample, 2012

	Hospital Control		
Primary payer	Public	Private, non-profit	Private, for-profit
Medicare	11.6%	12.1%	13.5%
Medicaid	9.7%	10.8%	13.3%
Private	14.1%	14.2%	17.7%
Uninsured	12.6%	13.6%	15.4%

Table 50: Berdahl.

Results: 362,494 patient visits met criteria for analysis. Consistently, higher admission rates were experienced at private for-profit hospitals, and this was most marked for patients with private insurance (21.5%). The lowest admission rates were seen most consistently at public hospitals (11.9% for uninsured patients). The highest rate of RIW was seen among privately insured patients at private for-profit hospitals (17.7%), and the lowest was seen among Medicaid patients at public hospitals (9.7%). (Tables 1A & B)

Conclusion: Emergency department patients presenting with chest pain are most likely to be admitted to the hospital or undergo RIW if they present to for-profit hospitals; they are least likely to be admitted or undergo RIW at public hospitals. Rates also vary by patient insurance status. Future work is necessary to determine whether or not patient-centered outcomes differ among different hospital ownership and payer groups.

51 Prehospital Provider Assessment of "Chest Pain" Chief Complaints as Non-Cardiac Events

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Background: EMS has clinical protocols for a variety of chief complaints. These protocols guide clinical care, but occasionally there are deviations. In a midsized urban EMS system investigated in this study, there is a protocol for patients presenting with the chief complaint of chest pain. The protocol's key tenets are obtaining a prehospital EKG, the administration of aspirin, and the option to give nitroglycerin.

Objectives: To analyze and determine the rate at which acute myocardial infarction occurs in patients transported by EMS with the chief complaint of chest pain, in whom EMS deviates from the accepted local chest pain protocol.

Methods: We performed a retrospective chart review of all consecutive patients transported to one of two academic emergency departments by the local fire based EMS in the year 2014. Charts were selected if: the dispatch chief complaint was chest pain, EMS's assessment at the scene was the patient's chief complaint was chest pain, or EMS initiated the chest pain protocol. Patients were included if EMS did not provide aspirin, obtain a prehospital EKG, or did not administer nitroglycerin. They were concluded to have an acute myocardial infarction if the patient had a hospital 12 lead EKG showing a STEMI, an elevated troponin not deemed to be due to other factors, or invasive cardiac imaging with intervention. Patients were excluded if there was a documented reason why aspirin was not given. In the study there were 1021 patients transported for chest pain to these two hospitals, of these there were 389 patients (38%) that met inclusion criteria.

Results: Of the 389 patients meeting inclusion criteria, 28 (7.2%) had an acute myocardial infarction. None of these 28 patients received prehospital aspirin or nitroglycerin, and one of them did not have a prehospital EKG; ten underwent cardiac intervention. Of the 389 patients meeting inclusion criteria, none received prehospital aspirin, one was given prehospital nitroglycerin, and 36 (10.8%) did not receive a prehospital EKG.

Conclusion: 7.2% of patients with chest pain in whom EMS deviated from protocol were found to have an acute myocardial infarction; 2.7% of all patients transported for chest pain in 2014 had an AMI and EMS protocol deviation. Further investigation of outcomes during protocol compliance is needed.

52 Prehospital Providers' Performance in Identification of ST-Segment Elevation Myocardial Infarction (STEMI)

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Background: Prehospital catheterization lab activation often relies upon prehospital providers' interpretation of an on-scene electrocardiogram. Recognition of patterns associated with coronary occlusion and differentiation from STEMI mimics can be challenging. There have been few studies to date of prehospital providers' accuracy in this critical task.

Objectives: To evaluate prehospital providers' accuracy in identification of STEMI on ECG.

Methods: Paramedics and flight nurses affiliated with two US Level 1 Trauma Centers were invited to anonymously participate in an online test of their ability to distinguish STEMI (coronary occlusion with < TIMI-3 flow) from not-STEMI (open artery with TIMI-3 flow) in 100 randomized ECGs of patients who subsequently underwent cardiac catheterization. Forty STEMI ECGs (20 anterior, 14 inferior, 8 posterior, 4 LBBB, 2 RBBB, 2 right-sided and 2 paced) were selected randomly from subgroups of the STEMI CORE Measure Database. Sixty non-STEMI ECGs (RSR', old infarction, non-diagnostic TW inversion, early repolarization, LVH, LBBB, RBBB, left hemiblock, ventricular pacing) were taken from patients who underwent ED chest pain rule out.

Results: One hundred and thirty three providers participated of whom 114 were paramedics and 19 were flight nurses. Participants averaged 9.4 hours (95% CI: 7.7 - 11.3) of combined formal and informal ECG training. Eighty-one participants had professional tenure of greater than 5 years. Aggregate sensitivity, specificity and accuracy in the identification of STEMI were 70.0% (67.3 - 72.6), 92.3% (91.1 - 93.5), and 83.4% (82.3 - 84.5) respectively. False negative rates averaged 30.0% (27.4 - 32.7) and were highest in cases of right-sided STEMI (63%) and paced rhythms (53%). There were no significant relationships between test performance and provider occupation, tenure or hours of ECG training.

Conclusion: Based on the findings of this observational study, it is reasonable to design a catheterization lab activation protocol based on prehospital ECG interpretation. However, educational efforts to improve the sensitivity of prehospital providers in the identification of STEMI require greater focus.

53 EMS Trends in Out-of-Hospital Cardiac Arrest Trials Since 1975

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Background: Over time there have been efforts to improve EMS care for out-of-hospital cardiac arrest (OOHCA). We used the control groups from RCTs from 1975 to present to study trends in EMS response to out of hospital cardiac arrest.

Objectives: The control groups in OOHCA RCT's can be utilized to identify trends over time in EMS management of out of hospital cardiac arrest.

Methods: Comprehensive literature search for prospective RCTs in OOHCA with n > 50 in control group from 1975 to the present. Linear and logistic regression analysis were performed to analyze possible trends in mean EMS arrival time, mean number of defibrillation attempts, percent witnessed by EMS and percent bystander CPR.

Results: A total of 59 RCTS were identified. Quantitative analysis shows no significant change in mean EMS arrival time ($p = 0.46$), mean number of defibrillation attempts by EMS ($p=0.61$) or the percent of OOHCA witnessed by EMS ($p = 0.078$). There was a statistically significant increase in percent bystander CPR ($p=0.03$).

Conclusion: From 1975 and the present, we were unable to demonstrate significant trends in EMS arrival time, number of defibrillation attempts, and percent of OOHCA witnessed by EMS. There may be a trend toward increased bystander CPR. Retrospective

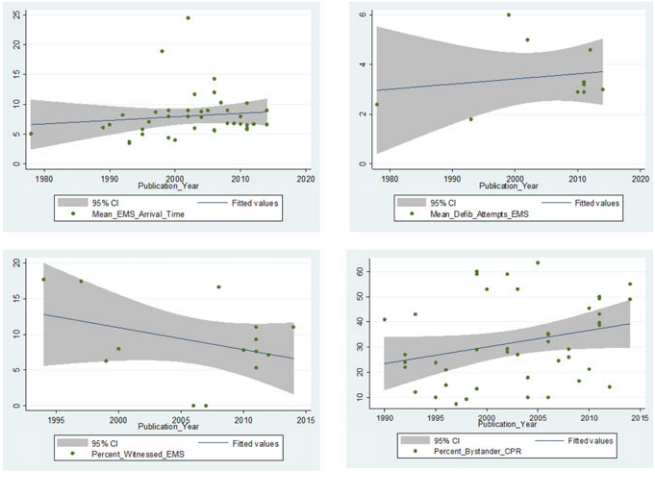

Figure 53 – Jones

methodology and confounding large variances between RCT sites limit the sensitivity of the methodology. RCT sites are limited in geography and tend to be only tertiary centers. Results are likely hypothesis generating only and may not be generalizable.

54 Regionalization of Acute Stroke Care and Treatment Outcomes: Trends Over a Five Year Period

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Background: Recent studies have shown the positive impact of regionalization on the treatment rates with intravenous tissue plasminogen activator (IV t-PA) in the immediate post- intervention phase. However, the long term effect of regionalization on outcome is not well studied.

Objectives: Our objective is to determine if regionalization of acute stroke care (AIS) is associated with improved treatment rates over a five year period.

Methods: This is a before-after observational study of all ambulance transported patients with a discharge diagnosis of acute ischemic stroke. We excluded inter-facility transports and direct admissions. Our data sources were the patient discharge abstract file from the Office of Statewide Health Planning and Development (OSHPD) and prehospital records. Probabilistic matching was used to link the records. Relative risk regression was performed to study the independent association of regionalization with IV t-PA use after controlling for patient, hospital demographics and stroke center status. Data analysis was performed using SAS 9.2

Results: Number of ambulance transported AIS patients to 13 hospitals in both counties were 4282 in the "before-phase" and 15571 in the "after-phase" (County 1 "after-phase" n=11368 (73%), County 2 "after-phase" n= 4203 (27%). In the "after-phase", 10189 (65.4%) were transported to primary stroke centers and 14981 (96.2%) were treated at community hospitals. In the "before-phase" IV t-PA was given to 79 patients (1.9%) and in the "after-phase" IV t-PA was given to 514 patients (3.3%). After controlling for variables, regionalization was independently associated with higher use of IV t-PA (Overall RR: 2.4 95% CI 1.4, 4.1) aRR for County 1 - 1.2 95% CI 0.82, 1.65aRR for County 2 - 2.4 95% CI 1.4, 4.1 -Please refer to Figure 1 (Graphs with 95% CI)

Independent Association of Regionalization with IV t-PA use

Variable	Risk Ratio (Adjusted)	P-Value	95% CI	
			Upper	Lower
Age in years				
50-59	1.5	0.14	0.88	2.45
60-69	1.3	0.46	0.66	2.52
70-79	1.5	0.14	0.81	2.72
>=80	1.4	0.34	0.71	2.66
Female	1.001	0.99	0.79	1.27
Race/Ethnicity				
Hispanic	1.26	0.11	0.95	1.68
NonHispanic White	1.38	0.01	1.06	1.79
NonHispanic Other	0.9	0.7	0.5	1.6
Unknown	1.94	0.04	1.02	3.67
Primary Stroke Center Status	1.1	0.6	0.78	1.55
Weekend	1.002	0.98	0.83	1.21
Regionalization status	2.4	0.002	1.4	4.14

Table 54: Govindarajan.

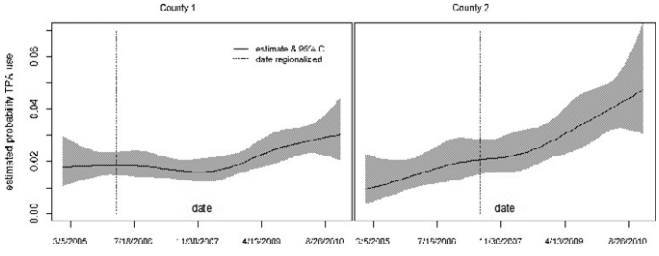

Figure 54 – Govindarajan

Conclusion: Regionalization was associated with higher rates of thrombolysis in AIS patients.

55 Assessing Factors Associated with Pediatric Frequent Emergency Department Utilization

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Background: There has been a focus on improving resource utilization among patients who are frequent users of acute care services, specifically frequent users of emergency departments (EDs). Most studies have focused on adult frequent users, but only a few studies have focused on pediatric frequent users.

Objectives: The objectives of this study were to (1) characterize demographic and clinical correlates of pediatric frequent users and (2) quantify use of multiple and different types of emergency departments using a statewide database.

Methods: This was a multi-center retrospective longitudinal cohort study of hospital ED visits using non-public data from 325 licensed non-military acute care hospitals in the state of California. Visits without a valid patient identifier and patients who expired were

excluded. All patients age 1 through 7 were included and categorized as 1-4, 5-9, 10-14, and 15-17 years of age. The number of visits per patient was determined by identifying the last visit in 2013 and assessing utilization 365 days prior. Frequent use was defined as having 6 or more ED visits within 365 days. Logistic regression was used to identify independent associations between frequent use and demographic characteristics, spatial access to primary care, rurality of residence, clinical measures, and the licensure of EDs visited (pediatric vs general).

Results: There were 688,582 pediatric patients identified in 2013 who accounted for 1,228,613 visits. Among these patients, 15,356 (2.2%) were identified as a frequent ED user and accounted for 113,736 (9.3%) of all pediatric visits. Only 57 (0.4%) frequent users had over 20 visits and a total of 10,623 (69.2%) never received care at a pediatric ED. In multivariate analysis, the strongest associations with frequent use were 5 to 9 years of age (OR 0.43, 95% CI 0.41-0.44) and 10 to 14 years of age (OR 0.42, 95% CI 0.40-0.44) compared to 1 to 4 year olds, Medicare/Medi-Cal (OR 2.1, 95% CI 2.0-2.2) compared to private, and having at least one inpatient admission (OR 5.5, 95% CI 5.3-5.7).

Conclusion: The majority of pediatric frequent users do not seek care in pediatric emergency departments and there does not appear to be a "super user" cohort as previously described in adult cohorts. Age, prior admission, and Medicare/Medi-Cal appear to have the largest impact on pediatric patient frequent ED utilization.

56 Potentially Avoidable Pediatric Transfer is Common for High-Risk Conditions in Rural Emergency Departments

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Background: Access to pediatric emergency care is limited in rural America. Inter-hospital transfer is the principal strategy to connect children with emergency specialty care, but several reports have highlighted problems with selection of children for transfer.

Objectives: The purpose of this study is to characterize the burden of potentially avoidable transfer (PAT) for children in a predominantly rural state and to identify diagnoses associated with PAT as targets for future intervention.

Methods: This study was a descriptive study of all children treated in Iowa emergency departments (EDs) and transferred between 2004 and 2013 using administrative claims data from a statewide database. Records were linked across inter-hospital transfer, and outcomes were ascertained from the discharging ED or inpatient record. PAT was defined as a child who was transferred and discharged from either the tertiary ED or from the hospital with ≤ 1 day hospital stay, and without having any separately billed procedures performed.

Results: Over 10 years, 2,086,819 children were included, of which 1% were transferred to another hospital (1.6% rate from rural zip codes). Only 63% were transferred to a designated children's hospital. PATs were identified in 8,393 cases (39% of all transfers). Sixty-eight percent of PATs were discharged from the receiving ED. The conditions most strongly associated with PAT were seizure (68% of seizure transfers were PAT), fracture (23% PAT), isolated traumatic brain injury without extra-axial bleeding (48% PAT), respiratory infection (38% PAT), and asthma or wheezing (58% PAT). Younger rural patients presenting to non-pediatric EDs comprised the greatest proportion of PATs.

Conclusion: Potentially avoidable pediatric inter-hospital transfer is common, comprising 39% of all pediatric transfers. Over 1/3 of children are transferred to non-pediatric centers. Several high-yield conditions have been identified that can be targeted for future interventions. Future work should focus on improving selection for children who benefit from inter-hospital transfer, to reduce the costly and distressing burden that potentially avoidable transfer places on rural patients and their families.

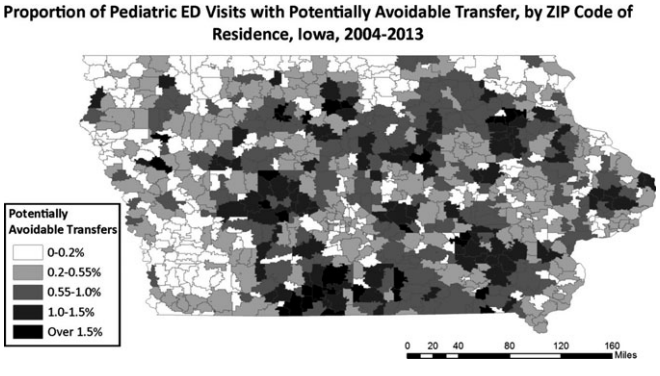

Figure 56 – Mohr

57 Adverse Events in the Pediatric Emergency Department

Amy Plint[1,2], Dale Dalgleish[1], Mary Aglipay[3], Nicholas Barrowman[3,2], and Lisa Calder[2,4]
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Background: Data regarding adverse events (AEs) (unintended harm to a patient related to health care provided) among children treated in the emergency department (ED) have not been collected despite identification of the setting and population as high risk.

Objectives: To estimate the risk and type of AEs, as well as their preventability and severity, for children seen in a paediatric ED.

Methods: This prospective cohort study examined outcomes of patients presenting to a paediatric ED. Research assistants (RA) recruited patients < 18 yrs old during 28 randomized 8-hr shifts (over 1 yr). Exclusion criteria included unavailability for follow-up and insurmountable language barrier. RAs collected demographics, medical history, ED course, and systems level data. A RA administered a structured telephone interview to all patients at day 7, 14, and 21 to identify flagged outcomes (such as repeat ED visits, worsening/new symptoms, etc). Admitted patients' health records were screened with a validated trigger tool. For all patients with flagged outcomes or triggers, 3 ED physicians independently determined if an AE occurred. Primary outcome was the proportion of patients with an AE within 3 weeks of their ED visit.

Results: We enrolled 1367 (70.3%) of 1945 eligible patients. Median age was 4.3 yrs (range 2 months-17.95 yrs); 676 (49.5%) were female. Most (n= 1279; 93.9%) were discharged. Top entrance complaints were fever (n=206,15.1%), cough (n=135, 9.9%), and difficulty breathing (n=108, 7.9%). Eight eighty (6.5%) patients were triaged as Canadian Triage and Acuity Score (CTAS) 1 or 2, 689 (50.6%) as CTAS 3, and 585 (42.9%) as CTAS 4 or 5. Only 44 (3.2%) were lost to follow-up. Flagged outcomes/triggers were identified for 498 (36.4%) patients. Thirty-three (2.4%) patients suffered at least one AE within 3 weeks of ED visit; 30 (90.9%) AEs were related to ED care. Most AEs (n= 28; 84.8%) were preventable. Management (n=18, 54.5%) and diagnostic issues (n=15, 45.5%) were the most common AE types. The most frequent clinical consequences were a need for medical intervention (n=15;45.5%) and another ED visit (n=13,39.4%). In univariate analysis, age (p=0.005) and weekday presentation (p=0.02) were associated with AEs.

Conclusion: We found a lower risk of AEs than that reported among inpatient paediatric and adult ED studies utilizing similar methodology. A high proportion of AEs were preventable.

58 Geospatial Analysis of Pediatric EMS Run Density and Endotracheal Intubation

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Background: Pediatric out-of-hospital airway management is a challenge for providers. The associations between geographic factors including transport distance and pediatric EMS run clustering on endotracheal intubation are unclear.

Objectives: The objective of this study was to determine if endotracheal intubation procedures are more likely to occur at greater distances from the hospital and near clusters of pediatric calls.

Methods: This was a retrospective observational study including all Emergency Medical Services (EMS) runs for patients less than 18 years of age from 2008 to 2014 in a geographically diverse Oregon county. We first computed descriptive statistics for all patients in the cohort in comparison to those who were intubated to describe the population and identify associations between intubation and transport distance. We geocoded scene addresses using the automated address locator created in ArcGIS supplemented with manual address geocoding for remaining cases. We successfully matched over 95% of addresses. We then use the Getis-Ord Gi spatial statistic feature in ArcGIS to map statistically significant spatial clusters (hot spots) of pediatric EMS runs. We then superimposed all intubation on the map of these hot spots.

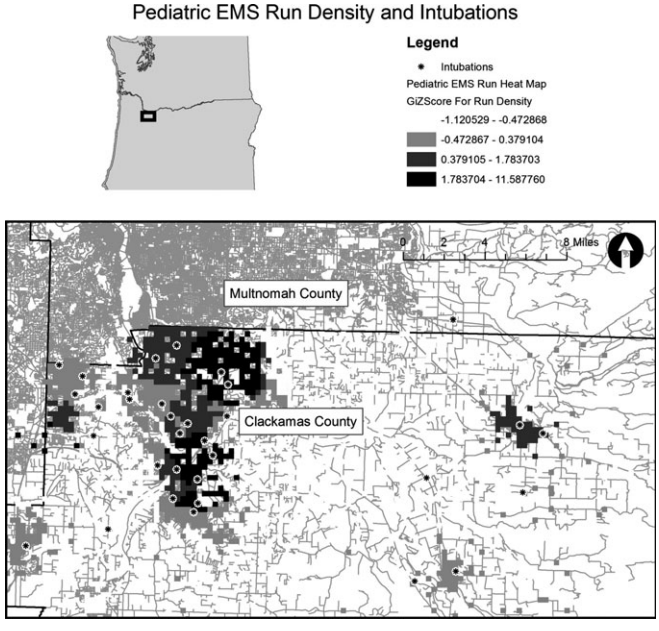

Figure 58 – Hansen

Table 1
Welch

	Non-intubated Patients n=7759	Intubated Patients n=38	P-value
Mean Age (SD)	10.6 (6.1)	13.0 (5.4)	0.014
Sex (% female)	43.6%	47%	0.89
Mean Ground Distance Traveled (SD)	15.9 (13.8)	10.4 (11.3)	0.014
Lights & Sirens	8.9%	94.7%	<0.001
Scene is a home	34.0%	42.4%	0.32
Children's Hospital Destination	41.1%	52.6%	0.15

Results: We identified a total of 7797 pediatric EMS runs during the study period and 38 endotracheal intubations. Patients who were intubated were similar to those who were not in sex and whether or not they were transported to a children's hospital. Intubated patients were transported with lights and sirens more commonly and tended to be transported shorter distances (Table 1). Patients who were intubated were older than non-intubated patients. The location of intubations was superimposed on hot spots of all pediatric EMS runs. A map focused on the portion of the county where hot spots were located is displayed in Figure 1. Most of the intubations occurred outside the areas where pediatric calls were highly clustered (dark black portions of the map)

Conclusion: In this geographically diverse county, it appears that the location of intubation procedures is not similar to the clustering of pediatric calls and that intubated patients were transported shorter distances on average compared to non-intubated patients.

59 A Prospective Study of Patients Receiving Prehospital Ketamine for Profound Agitation

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Background: Profound agitation (PA) in the prehospital environment is commonly encountered and represents a safety issue for both patients and their caregivers. Ketamine (K) is an emerging drug for PA, however data is limited mostly to retrospective case series.

Objectives: We sought to establish the time to adequate sedation for patients receiving K for PA in the prehospital environment, and to characterize these patients prospectively.

Methods: This was a prospective Waiver of Consent study (45 CFR 46.116) of all adult patients in our EMS system needing chemical restraint for PA that were transported to our ED from October 2014 to November 2015. All patients received 5 mg/kg of intramuscular K. All paramedics in our EMS system were trained in the Altered Mental Status Scale (AMSS), a validated ordinal scale of agitation. Patients were enrolled if their AMSS score was +4. Paramedics carried stopwatches and measured time to adequate sedation (AMSS ≤ +1) after injection. Secondary outcomes included need for additional sedatives, ethanol concentration, urine drug screen results, serum lactate and pH, intubation frequency, complications, and length of ED and/or hospital stay.

Results: 51 subjects were enrolled. Median age was 29 years (range 18 - 66), 77% were male, 48% were Caucasian, 37% were Black American, and 9% were Native American. A documented history of mental illness was present in 57% (29/51). Median time to adequate sedation was 4.2 min (range 1-25 min). 92% (45/51) had adequate sedation prehospital. 16% (8/51) required an additional drug prehospital. Median ethanol concentration was 90 mg/dL (0 - 363). Urine drug screens (n = 17/30 positive) were positive for opioids (n = 7), cocaine (n = 6), amphetamines (n = 4), benzodiazepines (n = 2), THC (n = 2), & LSD (n = 1). Median serum lactate was 3.2 mmol/L (1.2 - >14.8). Median pH was 7.34 (6.91-7.49). Intubation occurred in 53% (27/51) of patients. Complications included hypersalivation (n = 9), vomiting (n = 3), and emergence reaction (n = 2). No laryngospasm or deaths occurred. Median ED stay was 88 min (25 - 995). Median hospital stay (n = 30) was 1.7 days (0.25 - 29).

Conclusion: In patients with profound agitation (AMSS = +4) in the prehospital environment, ketamine typically provides effective sedation.

60 Incidence of Outcomes Based on Field Triage in Older Adults with Blunt Head Trauma Transported by EMS

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Megan A. Gilbert[1], James Chenoweth[1], David R. Vinson[1], Dustin W. Ballard[10], Kiarash Shahlaie[1], and James F. Holmes[1]
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Background: The 2011 Guidelines for Field Triage of Injured Patients recommend patients that do not meet physiological (step 1), anatomical (step 2), or mechanism of injury (step 3) criteria but are anticoagulated with head trauma (step 4, "special considerations") should be transported to a trauma center or hospital capable of timely management.

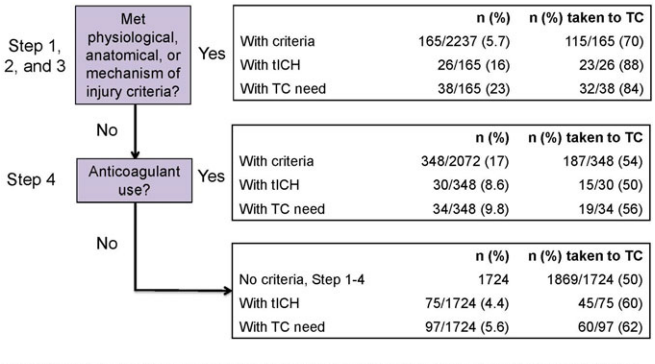
Objectives: We evaluated the incidence of acute traumatic intracranial hemorrhage (tICH) and trauma center need based on the presence or absence of field triage criteria.

Methods: We conducted a countywide, retrospective study at 5 EMS agencies and 11 hospitals (4 trauma centers) of older adults (≥55 years) who were transported to a hospital by EMS after head trauma during 2012. Data were abstracted from EMS medical records and matched to ED and hospital records. The primary outcomes of 1) acute tICH on CT imaging and, 2) trauma center need (composite outcome of acute tICH, death, neurosurgical intervention, emergency surgery, or injury severity score 16 or greater) were analyzed in 1 of 3 field triage groups: 1) step 1, 2 or 3 of field guidelines criteria present; 2) step 1-3 criteria not present but anticoagulated; or 3) no criteria present. We also reported the proportions of patients taken to a trauma center within each field triage group.

Results: 2237 patients were included for analysis; median age was 74 years old (IQR 62-85 years) and 899 (40%) were male. The most common mechanism of injury was fall from standing height or less (69%) and most patients had an initial EMS Glasgow Coma Scale score of 14 or 15 (96%). Of the 348 (17%) patients who did not have step 1-3 criteria present but were anticoagulated, 187 (54%) were taken to a trauma center, 30 (8.6%) had a tICH and 34 (9.8%) had a trauma center need (Figure).

Conclusion: Older adults with head trauma who do not meet step 1-3 triage criteria but are anticoagulated have a relatively high incidence of acute tICH and the need for a trauma center. Nearly half of these patients are not taken to a trauma center.

Figure. Incidence of outcomes by field triage criteria, n=2237



Abbreviations: TC; Level 1 or 2 trauma center; tICH, acute traumatic intracranial hemorrhage; TC need is a composite outcome that includes acute tICH, death, neurosurgical intervention, non-orthopedic surgery in first 24 hours of hospitalization, or injury severity score 16 or greater

Figure 60 – Nishijima

61 Diagnosis of Elder Abuse in U.S. Emergency Departments

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Background: Elder abuse is associated with significant morbidity and mortality, and has an estimated prevalence in the United States of 5-10%. EDs are an important site for identification of other forms of abuse including child abuse and intimate partner violence, but the epidemiology of elder abuse identification in U.S. EDs has not been described.

Objectives: We sought to estimate the proportion of older adults in US EDs receiving a diagnosis of elder abuse and characterize these patients.

Methods: Using the 2012 Nationwide Emergency Department Sample (NEDS), ED visits by patients aged 65 years and older with a diagnosis of elder abuse were identified using ICD-9 diagnosis codes and E-codes. The proportion of patients receiving a diagnosis of elder abuse was estimated using survey weights. Odds ratios were calculated

Evans Table. Odds ratios for elder abuse diagnosis in US EDs in calendar year 2012. (n= 23,097,740 ED visits)

	Odds Ratio (95% CI)	P Value
Female	1.90(1.60-2.25)	<0.001
Age, (years)		
65-69	Reference	
70-74	1.16(0.91-1.47)	0.22
75-79	1.06(0.81-1.38)	0.66
80-84	0.87(0.65-1.15)	0.32
85-89	1.15(0.88-1.51)	0.30
>90	1.00(0.71-1.40)	0.99
Charlson Comorbidity Index, Categories		
<1	Reference	
1-2	1.33(1.09-1.63)	0.006
2-3	1.11(0.85-1.45)	0.43
>3	1.18(0.92-1.52)	0.20
Common ED Diagnoses*‡		
Chest Pain	0.95(0.65-1.39)	0.81
Contusion/Superficial Injury	2.83(2.25-3.57)	<0.001
Chronic Obstructive Pulmonary Disease	1.01(0.81-1.27)	0.91
Urinary Tract Infection	2.25(1.86-2.71)	<0.001
Cardiac Dysrhythmias	0.99(0.80-1.22)	0.93
Abdominal Pain	0.36(0.20-0.65)	0.001
Spondylosis, Other Back Problems	0.95(0.72-1.26)	0.73
Pneumonia	0.79(0.55-1.12)	0.18
Septicemia	1.88(1.38-2.54)	<0.001
Congestive Heart Failure, Nonhypertensive	0.99(0.78-1.26)	0.95
Hospital Region		
Northeast	Reference	
Midwest	1.19(0.84-1.69)	0.32
South	1.23(0.93-1.63)	0.15
West	1.55(1.13-2.13)	0.007
Hospital Teaching Status		
Metropolitan Non-Teaching	Reference	
Metropolitan Teaching	1.77(1.42-2.21)	<0.001
Non-Metropolitan	1.15(0.89-1.48)	0.29

*10 most common ED diagnosis groups, ordered most to least common, identified using Clinical Classification Software (CCS) developed by the Agency for Health Research and Quality HCUPnet data tool.
‡ Referent group for common ED diagnosis odds ratios set as those patients without the CCS diagnosis group of interest

Table 61: Evans.

to identify patient demographic characteristics and common ED diagnoses associated with a diagnosis of elder abuse.

Results: The study sample contained 5,344,743 ED visits by older adults, representing an estimated 23,097,740 U.S. ED visits. Elder abuse was diagnosed in 3,172 visits, corresponding to a diagnosis prevalence of elder abuse among older adults in U.S. EDs of 0.014% (95% CI 0.0122- 0.0152%). Multivariable analysis showed significantly increased odds of the diagnosis of elder abuse in patients who were female (OR 1.90, 95% CI 1.60-2.25), as well as patients with contusion (OR 2.83, 95% CI 2.25-3.57), urinary tract infection (OR 2.25, 95% CI 1.86-2.71), and septicemia (OR 1.88, 95% CI 1.38-2.54; Evans Table). Abdominal pain was the only common diagnosis associated with decreased odds of the diagnosis of elder abuse (OR 0.36, 95% CI 0.20-0.65). The odds of elder abuse diagnosis were not significantly different across age categories.

Conclusion: The percentage of older ED patients receiving a formal diagnosis of elder abuse is two orders of magnitude lower than the estimated prevalence in the population. Elder abuse was more likely to be identified in female patients and patients with contusions. Efforts to improve the identification of elder abuse in U.S. EDs may be warranted.

62 Health Care Utilization in Older Patients Visiting the ED for Mental Health Conditions

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Background: Patients over 65 years of age represent a growing population, accounting for almost 15% of total ED visits. Mental illnesses impose a substantial burden on this population.

Objectives: Among patients presenting to an Emergency Department (ED) with a mental health condition (MHC), we compared rates of subsequent repeat ED visits or inpatient admissions between patients over 65 years of age and younger adults.

Methods: We conducted a retrospective cohort analysis using OptumLabs Data Warehouse, a large database including administrative claims data on privately insured and Medicare Advantage enrollees from throughout the United States. We identified all patients discharged from an ED with a primary diagnosis of a MHC between 2005 and 2013. We excluded any patients without continuous medical coverage for the 12 months preceding and 31 days following the index ED visit. Primary outcome measures were return ED visits, and hospitalization within 30 days. Analysis comparing features between 2 cohorts (18-64 vs =>65 years) was performed and descriptive statistics are reported with chi-square values.

Characteristics of the population	Patients 18-64 years old	Patients ≥65 years old	P-value
Patients, n	277281	22679	
Age, mean(SD)	36.8 (13.7)	73.5 (5.5)	
Sex, n (%)			<0.001
Female	150585 (50.2)	13690 (60.4)	
Male	126696 (42.2)	8989 (39.6)	
Number of chronic conditions (Hwang codes), n (%)			<0.001
None	58794 (19.6)	3502 (15.4)	
1	55621 (18.5)	562 (2.5)	
2	50238 (16.7)	998 (4.4)	
3	38514 (12.8)	1501 (6.6)	
4	26439 (8.8)	2036 (9.0)	
+5	47675 (15.9)	14080 (62.1)	
Readmission Rates, N (%)			
3 days	8636 (2.9)	1235 (5.4)	<0.001
7 days	16843 (5.6)	2433 (10.7)	<0.001
30 days	38720 (12.9)	5530 (24.4)	<0.001
Schizophrenia and other psychotic disorders (CCS 659)	10720 (3.6)	4987 (22.0)	<0.001
Alcohol-related disorders (CCS 660)	73567 (24.5)	3228?(14.2)	<0.001

Table 1. Characteristics of all the population

Table 62: Castaneda-Guarderas.

Results: The study sample included 22,679 patients aged over 64 years old, and 277,281patients aged 18-64, with an ED visit due to a MHC. Older patients had a higher proportion of schizophrenia and other psychotic disorders (22% vs 3.6%, p<0.001), and a lower proportion of alcohol related disorders (14.2% vs 24.5%, p<0.001) at the index visit when compared to younger patients. Return rates at 3, 7 and 30 days were significantly higher for older patients compared to younger patients (5.4% vs. 2.9%, 10.7% vs 5.6% and 24.4% vs. 12.9% respectively; all with p<0.001).

Conclusion: Mental health visits to an ED are common and differ at the index ED visit between older and younger patients. Return rates after an initial MHC-related ED visit for patients over 65 years were twice as high as for younger patients. These findings can assist with risk stratification and identification of populations who may benefit from targeted follow-up practices.

63 High Sensitivity Troponin Measurements in Patients with Acute Non-ACS Cardiac and Non-Cardiac/ Unknown Origin Diagnoses: Results from the TRAPID-AMI Trial

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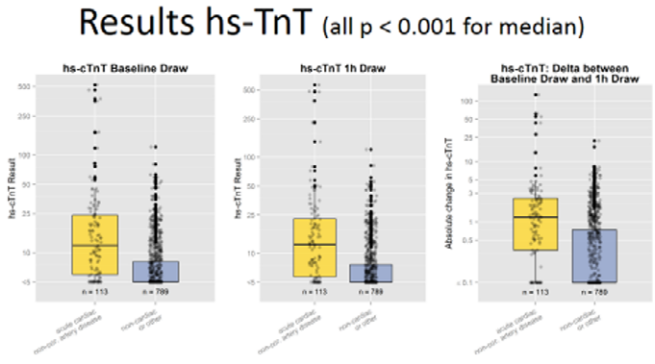
Background: High sensitivity cardiac troponin (hs-cTn) assays allow measurements below the 99th percentile of a healthy population. These values can be used for the early rule in/out of acute myocardial infarction (AMI). Hs-cTn measurements have not been detailed in Emergency Department (ED) patients with presenting possible AMI but with final non-ACS cardiac (NACSC) and non-cardiac/unknown origin (NCUO) diagnoses.

Objectives: To describe the baseline (T0), 1 hour (T1) and resultant delta hs-cTn values in ED patients with NACSC and NCUO diagnoses enrolled in the TRAPID-AMI study.

Methods: Patients with AMI symptoms (< 6 hours) were enrolled. At T0 and T1 hs-cTn was measured with 2 assays: hs-cTnT, Roche Diagnostics, level of detection (LoD) 5 ng/L, 99th % 14 ng/L and the Siemens cTnI-ultra, LoD 6 ng/L, 9th % 40 ng/L. The final diagnosis was independently adjudicated using all 60 day data, including the cTnI-ultra values.

Results: Of the 1282 patients studied 113 (8.8%) had NACSC while 789 (62.0%) had final NCUO diagnosis. Hs-cTn levels > LoD at T0 and T1 were observed in 79.6 and 78.8% (hs-cTnT) and 61.9 and 62.9% (cTnT-ultra) of NACSC and 37.4 and 38.1% (hs-cTnT) and 24.5 and 26.3% (cTnI-ultra) respectively in patients with NCUO etiology. For both

Figure. Hs-cTnT Measurements



	Median	Mean	% > 5	Median	Mean	% > 5	Median	Mean
NACSC	11.8	34.5	79.6	12.3	37.0	78.8	1.2	4.4
NCUO	< 5	8.5	37.4	< 5	8.39	38.1	0.0	0.8

Figure 63 – Nowak

assays the median hs-cTn values at T0, T1 and resultant delta 1 hour were very low but were significantly higher in those with NACSC compared to NCUO diagnoses (all $p < 0.001$). These results are detailed for hs-cTnT in the figure (cTnI-ultra measurements were similar).

Conclusion: Very low hs-cTnT levels were frequently measurable in suspected AMI ED patients with final NACSC (80% at T0 and T1) and NCUO (38% at T0 and T1) diagnoses. The median hs-cTnT values are significantly higher at T0, T1 and the delta in patients with NACSC v NCUO diagnoses. Similar results were seen using the cTnI-ultra assay. Serial hs-cTn measurements could help Emergency Physicians in determining the correct diagnosis for non ACS diagnosed patients (the vast majority of those enrolled).

64 Derivation of a 2-Hour High-Sensitivity Troponin T Algorithm for Rapid Rule-Out of Acute Myocardial Infarction in Emergency Department Chest Pain Patients

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Background: Chest pain and symptoms of acute coronary syndrome are responsible for a large proportion of ED visits and acute hospitalizations. However, only about 15% of patients presenting to the ED with high-risk symptoms do, in fact, have an acute coronary syndrome.

Objectives: To derive a 2-hour high-sensitivity Troponin T (hsTnT) testing algorithm with outcome based-cutoffs to rapidly rule out acute myocardial infarction (AMI) in a large proportion of ED chest pain patients.

Methods: Patients included consecutive ED patients with a chief complaint of cardiac chest pain who had an hsTnT assay performed at ED arrival and 2 hours after ED arrival. Administrative databases were queried to identify troponin results and major adverse cardiac outcomes (MACE) including death, MI, and revascularization. Test characteristics of iterative combinations of initial troponin level and absolute change in troponin level were quantified in order to identify the testing algorithm that identified the greatest proportion of patients eligible for early discharge while maintaining a target sensitivity of 98.5% for the primary outcome of 7-day AMI.

Results: 755 eligible patients had hsTnT assays performed at ED arrival and at 2 hours. 91 patients (12.1%) had a 7-day AMI while 108 (14.0%) had 7-day MACE. An initial hsTnT level of less than 14 ng/L, in combination with a 2-hour absolute change of less than 10ng/L had a sensitivity of 98.9% (95% CI 94.0,99.8) and NPV of 99.8% (95% CI 98.7, 100.0) for 7-day AMI. This identified 58.5% of all patients as being suitable for early discharge. Sensitivity and NPV for 7-day MACE were 93.5% (95% CI 87.2, 96.8) and 98.4% (95% CI 96.8, 99.2) respectively. Sex-specific differences in test characteristics were not clinically important. Rule-in hsTnT cutoffs were also evaluated, with specificities ranging from 85-95%, although cutoffs with higher specificity had less ability to rapidly rule-in AMI, leaving more patients with indeterminate results after 2 hours.

Conclusion: A hsTnT algorithm can rule out AMI in 58.5% of ED chest pain patients within 2 hours of ED arrival. The lower sensitivity of this algorithm for MACE speaks to the importance of clinical assessment and ECG findings in identifying patients at risk for acute coronary syndromes.

65 Predicting Short-Term Arrhythmia or Death among Emergency Department Patients with Syncope: The Canadian Syncope Arrhythmia Risk Score

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Background: Suspicion of arrhythmias among syncope patients is the leading cause of emergency department (ED) referrals and hospitalization. However, the risk factors for arrhythmias are not well defined.

Objectives: We sought to develop a risk prediction tool to identify syncope patients at risk for arrhythmia or death within 30-days after ED disposition.

Methods: This prospective cohort study involved 6 academic EDs that enrolled adult syncope patients. We collected standardized variables at index presentation from history, clinical examination, investigations including ECG, and patients' disposition. Adjudicated outcomes included death (due to arrhythmia or unknown cause), arrhythmia or procedural intervention to treat arrhythmias within 30-days after ED disposition. Multivariable logistic regression was used to derive the model (bootstrap sampling for internal validation and to estimate shrinkage and optimism).

Results: 5,010 adult syncope patients (mean age 53.4 years, 54.8% females, and 9.5% hospitalized) were enrolled with 106 (3.6%) patients suffering arrhythmia or death within 30-days after ED disposition. Of 39 candidate predictors examined, eight were included in the final model: vasovagal predisposition, heart disease, any ED systolic blood pressure <90 or >180 mmHg, troponin (>99%ile), QRS duration >130msec, QTc interval >480msec and ED diagnosis of cardiac, or

Canadian Syncope Arrhythmia Risk Score

Items	Points
1. Clinical evaluation	
a) **Vasovagal predisposition***	**-1**
b) **History of heart disease**†	**1**
c) **Any ED systolic blood pressure < 90 or >180 mmHg**‡	**1**
d) **ED diagnosis of vasovagal syncope**	**-1**
e) **ED diagnosis of cardiac syncope**	**2**
2. Investigations	
a) **Troponin elevated (> 99%ile normal population)**	**1**
4. Electrocardiogram	
a) **QRS duration >130 milliseconds**	**2**
c) **Corrected QT interval >480 milliseconds**	**1**
Total Score (-2 to 8):	___

ED = Emergency Department
*Warm-crowded place, prolonged standing, fear, emotion or pain
†Includes history of coronary or valvular heart disease, cardiomyopathy, congestive heart failure or non-sinus rhythm (ECG evidence during the index visit or documented history of ventricular or atrial arrhythmias, or device implantation)
‡Includes blood pressure values from triage until ED disposition

Risk Categories for Arrhythmias/Death

Total Score	Risk§	Category
-2	0.2%	Very Low
-1	0.5%	Very Low
0	0.9%	Very Low
1	1.9%	Low
2	3.8%	Medium
3	7.5%	Medium
4	14.3%	High
5	25.4%	High
6	41.1%	Very High
7	58.8%	Very High
8	74.5%	Very High

§Shrinkage-Adjusted Expected Risk

Figure 65 – Thiruganasambandamoorthy

vasovagal syncope [C-statistic optimism corrected: 0.91 (95%CI 0.87-0.93); Hosmer Lemeshow p=0.08]. The Canadian Syncope Arrhythmia Risk Score had a risk ranging from 0.2% for a score of -2 to 74.5% for a score of 8. Sensitivity for threshold score ≤-1 was 100% and specificity for a score of ≥4 was 97.0%.

Conclusion: The Canadian Syncope Arrhythmia Risk Score can improve acute management by more accurate identification of patients at risk for arrhythmias/death within 30-days of ED disposition. Higher-risk patients if discharged home will benefit from out-of-hospital cardiac monitoring.

66 Short-Term Risk of Arrhythmias Among Emergency Department Syncope Patients with Atrial Fibrillation

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Background: Short-term risk of arrhythmia or death among emergency department (ED) syncope patients with atrial fibrillation/flutter (AFF) is not known.

Objectives: Our objectives were to assess the incidence and the independent risk of AFF for 30-day arrhythmia or death after ED disposition.

Methods: We conducted a prospective study at 6 EDs to include adults with syncope. We collected demographic, clinical and ECG characteristics. Patients with current ECG evidence or documented history of AFF were designated as the AFF cohort, and those without evidence or documentation of non-sinus rhythm were assigned to the sinus rhythm cohort. Primary outcome was arrhythmia or death within 30-days after disposition. Secondary outcomes included non-arrhythmic cardiac and non-cardiac outcomes. We performed descriptive and logistic regression analyses.

Results: We enrolled 4,266 patients: mean age 53.4 years, 55.4% females, and 8.5% with AFF. After excluding those with outcomes in the ED, lost to follow-up and those with other non-sinus rhythms, 3,417 patients in the sinus and 280 patients in the AFF groups were analyzed. The incidence of arrhythmia or death was significantly higher in the AFF group (Relative Risk 5.1; 95% CI 3.1-8.4; p<0.0001). There were no significant differences in secondary outcomes between the groups. After adjusting for important baseline risk factors by multivariable analysis (Table 1), the odds ratio for arrhythmia or death in patients with AFF was 1.5 (95% CI 0.8-2.7).

Conclusion: The risk of AFF for 30-day arrhythmia or death among syncope patients after ED disposition is higher but is attenuated when adjusted for important patient characteristics.

67 Presentations for Hypoglycemia Associated with Diabetes Mellitus to Emergency Departments in a Canadian Province: A Database and Epidemiological Analysis

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Table 1
Thiruganasambandamoorthy: Risk Factors for 30-Day Arrhythmia or Death after ED Disposition among Syncope Patients with AFF

Variable	β Coefficient	S.E	P-Value	Odds Ratio	95% C.ILower	95% C.I Upper
Atrial Fibrillation/Flutter	038	031	0.22	1.46	0.80	2.67
Age	0.04	0.01	<0.0001	1.04	1.02	1.06
Male	0.63	0.27	0.02	1.87	1.11	3.16
Coronary Artery Disease	0.17	0.30	0.56	1.19	0.67	2.13
Valvular Heart Disease	0.77	0.37	0.04	2.16	1.05	4.47
Congestive Heart Failure	0.20	0.41	0.62	1.23	0.55	2.76
Diabetes	0.27	0.32	0.39	1.31	0.70	2.46
Hypertension	0.17	0.29	0.54	1.19	0.68	2.08
Corrected QT Interval	0.02	0.003	<0.0001	1.02	1.01	1.02

Area Under the Curve: 0.855 (0.813 to 0.900)
Hosmer-Lemeshow Goodness-Of-Fit P-Value:0.363 **S.E = Standard Error**

Background: Diabetes mellitus (DM) is a major and global chronic disease. Prevalence of diabetes was 9% globally in 2014 and 9.3% in Canada and 7.2% in Alberta in 2015. Complications of the disease are numerous and frequent. Hypoglycemia is one complication of diabetes treatment.

Objectives: The objective of this study was to quantify and characterize presentations by adults to Alberta emergency departments (EDs) for hypoglycemia associated with type 1 (T1DM) or type 2 (T2DM) diabetes.

Methods: A retrospective cohort study was conducted using data for Alberta for a five-year period (fiscal years 2010/11-2014/15). Data were sourced from an administrative database: National Ambulatory Care Reporting System (NACRS). Records of interest were those with an ICD-10-CA diagnosis of DM-associated hypoglycemia (i.e., E10.63, E11.63, E13.63, or E14.63). A descriptive analysis was conducted.

Results: Data extraction yielded 7,835 presentations by 5,884 patients. The majority of presentations were by males (56.2%) and median patient age was 62. These episodes constituted 0.08% of presentations to Alberta EDs and they occurred at an event rate of 0.67 episodes per 100 patient-years (95% CI: 0.66-0.69). The annual rate of presentations decreased by 11.8% during the five-year period. Most presentations (63.4%) involved transportation to the ED via ambulance. Relative to LOS for ED presentations for all reasons, average length-of-stay (LOS) was 3.2x longer and 1.4x longer for discharged and admitted patients, respectively. For 27.5% of presentations, an X-ray was obtained. Most hypoglycemic episodes (65.2%) were considered to be of moderate severity while 34.3% were considered to be severe. None were mild because all involved access to an ED. The condition mainly (absolute terms) afflicted people with T2DM and urban areas; however, it disproportionately afflicted people with T1DM and rural areas.

Conclusion: For a condition that is largely preventable with effective blood glucose management, DM-associated hypoglycemia incurs significant healthcare resource use. People with DM would be better served with more effective and safer euglycemic agents.

68 Hospital Selection Changes Case-Mix for Rural Hospitals Among Patients with Severe Sepsis or Septic Shock

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Background: Sepsis survival has been associated with hospital volume, and part of this effect may be attributable to emergency department care. We have shown previously that inter-hospital transfer is associated with higher mortality.

Objectives: The purpose of this study is to identify factors associated with rural sepsis patients' hospital choice.

Methods: This study was a cohort study of all adults treated in Iowa EDs with severe sepsis between 2005 and 2014 using administrative claims data from a statewide database. A subset of the database (the rural choice cohort) was defined as those residing ≥ 20 miles from a top-decile (based on hospital sepsis volume) hospital and < 20 miles from a local hospital. The cohort was divided into those who sought initial care at a local hospital vs. those initially presenting to a top-decile hospital. Demographics, insurance status, comorbidities, and outcomes were compared.

Results: A total of 18,246 patients with severe sepsis were identified, of which 13,870 were part of the rural choice cohort. Only 5.5% of the rural choice cohort (n = 761) presented initially to a top-decile hospital. Patients who initially chose a top-decile hospital were younger (64.8 vs. 72.8 y, p = <.001) and were much more likely to have commercial insurance (19.8% vs. 10.6%, p <.0001) than those who were seen initially at a rural hospital. They were also more likely to have significant medical comorbidities, such as liver failure (9.7% vs 4.2%, p<.001), metastatic cancer (5.6% vs 3.1%, p<.001), and peripheral vascular disease (13.1% vs. 9.6%, p = 0.002). Using multivariable regression, sepsis patients who presented to local hospitals in this cohort had lower mortality (adjusted OR = 0.76, 95% CI 0.63-0.92).

Conclusion: Most rural sepsis patients seek care in local hospitals. Patients who choose to seek initial care in rural hospitals are older, less likely to have commercial insurance, and have fewer comorbidities than those who travel initially to high-volume centers. This imbalance of patient-hospital selection must be considered in health-services research and may influence estimates of the effect of rural sepsis interventions on clinical outcomes.

69 Cost-Implications of Hospital Variation in Observation Service Utilization for Suspected Acute Coronary Syndromes

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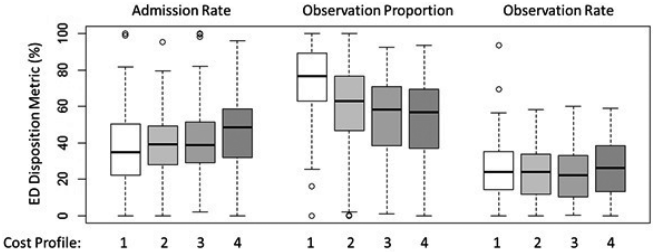
Background: Previous trials have demonstrated lower hospitalization costs for patients evaluated in observation for suspected acute coronary syndromes (ACS), yet observational studies describing the actual use and economic implications of observation use are limited.

Objectives: To describe hospital-level variation in observation service utilization for ED patients with suspected ACS and the relationship between observation service use and hospital costs.

Methods: Cross-sectional analysis of the Premier hospital dataset including hospital clinical and cost data between 2011 and 2013. We included all adult ED visits for suspected ACS and excluded all visits for AMI, PE, aortic dissection, and hospitals with fewer than 25 ED visits. We measured hospital observation service use as 1) observation rate, the proportion of all ED visits for suspected ACS admitted to observation and 2) observation proportion, the proportion of all observation and inpatient admissions for suspected ACS first admitted to observation. We calculated both unadjusted and risk-standardized hospital observation rates, observation proportions and mean per-visit costs (inclusive of all ED, observation and inpatient costs) using hierarchical generalized linear models adjusted for patient characteristics and a random hospital effect. We report observation and admission measures by 4 hospital cost profiles identified using K-means clustering.

Results: We included 2,867,181 ED visits for suspected ACS across 480 hospitals. There was substantial hospital-level variation in the observation rate (median: 24%; $10^{th}/90^{th}$ %ile: 4%-43%) and the observation proportion (61%; 22%-88%). The correlation between hospital risk-standardized observation rates and per-visit cost was 0.25 (p <0.0001) while the correlation between risk-standardized observation proportion and per-visit cost was -0.22, (p<0.0001). 72 hospitals with the lowest risk-standardized cost profile demonstrated lower admission rates and a higher observation proportion while the 98 highest cost hospitals demonstrated higher admission rates and slightly higher observation use. Venkatesh Fig 1



Cost Profile	Hospital, n	Mean Risk-standardized Cost, $
1	72	$1309.47
2	147	$2074.36
3	163	$2488.05
4	98	$2961.30

Figure 69 – Venkatesh

Conclusion: While higher observation service use may broadly be associated with lower hospital costs, the hospitals with the highest use of observation services appear to be costlier as a result of fewer discharges.

70 Emergency Physician Attitudes and Knowledge of ACEP's Choosing Wisely Recommendations

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Background: In 2013, ACEP joined the Choosing Wisely (CW) campaign to reduce unnecessary tests and procedures in emergency medicine. Emergency physician (EP) attitudes and knowledge of the CW campaign are unknown.

Objectives: To assess EP practice patterns, attitudes and knowledge of CW recommendations.

Methods: An anonymous 41-item survey instrument was iteratively developed through review by content experts and pilot testing. In October 2015 we administered a cross-sectional survey of U.S. EPs at a large, national professional meeting.

Results: We approached 819 EPs; 755 (91.6%) completed the survey. Two-thirds (68%) of respondents were male; 47% practiced in academic settings and 47% in community settings. The range of EPs who frequently or always performed a test or procedure despite CW recommendations was 5.6 to 29.9% (Table). The most frequently performed test was head CT for minor head injury in patients deemed low-risk by decision rules (29.9%), followed by antibiotics for sinusitis (26.9%). The most infrequent practices were Foley catheter for patients who can void and lumbar X-ray for non-traumatic back pain. EPs reported patient and family expectations as the most important reason for ordering head CT after minor head injury, imaging for non-traumatic low back pain, and antibiotics for sinusitis; however, concern for serious diagnosis was the most important reason for performing CT chest in patients with normal D-dimer and CT abdomen for recurrent renal colic. For 9 of 10 recommendations, more EPs cited "concern for serious diagnosis" as the most important reason than "reduce malpractice risk." Few (5.6%) respondents were able to correctly identify 5 out of 5 CW recommendations. As a result of the CW campaign, a majority (65%) of EPs are more comfortable discussing unnecessary tests and procedures with patients, 55% have reduced unnecessary tests and procedures, and 53% of aware of efforts in their ED or hospital to promote the CW recommendations.

Conclusion: EPs continue to report performing avoidable tests and procedures despite CW recommendations. More research is needed to identify effective ways to change behavior and improve quality.

Table. Emergency Physician Adherence to Choosing Wisely (Columns 2-4) and Most Important Reasons for Ordering Unnecessary Tests or Treatments (Columns 6-10).

Clinical scenario	Never or Rarely N (%)	Sometimes N (%)	Often or Always N (%)	Patient or Family Expectation N (%)	Reduce Malpractice Risk N (%)	Concern for Serious Diagnosis N (%)	Typical Practice In My ED N (%)	Saves Time N (%)
X-ray of lumbar spine for non-traumatic low back pain	559 (73.1)	146 (19.1)	60 (7.8)	376 (58.4)	54 (8.5)	164 (25.7)	25 (3.9)	20 (3.1)
Antibiotics for uncomplicated abscess after successful I&D	472 (61.2)	151 (19.7)	142 (18.6)	300 (46.5)	72 (11.2)	152 (23.6)	111 (17.2)	10 (1.6)
Antibiotics for acute sinusitis	359 (46.9)	200 (26.1)	206 (26.9)	467 (69.2)	26 (3.9)	119 (17.7)	40 (5.9)	22 (3.3)
Chest CT for pulmonary embolism in patient with normal D-dimer	556 (72.7)	126 (16.5)	83 (10.9)	97 (15.7)	171 (27.7)	318 (51.5)	23 (3.7)	8 (1.3)
Abdomen/ pelvis CT for recurrent uncomplicated kidney stones	399 (52.2)	215 (28.1)	151 (19.7)	144 (22.0)	74 (11.3)	286 (43.6)	113 (17.2)	39 (6.0)
Head CT for minor head injury for patient who is low-risk per Canadian or New Orleans head CT criteria	332 (43.4)	204 (26.7)	229 (29.9)	274 (41.9)	168 (25.7)	164 (25.1)	33 (5.1)	15 (2.3)
Head CT for syncope (insignificant head trauma, normal neuro exam)	494 (64.6)	159 (20.8)	112 (14.6)	183 (29.0)	154 (24.4)	217 (34.4)	62 (9.8)	15 (2.4)
Foley catheter for urine output monitoring in patient who is able to void	629 (82.2)	93 (12.2)	43 (5.6)					
Palliative care or hospice referral from the ED for an 80-year- old patient with stage 4 lung cancer who presents with worsening rib pain due to metastasis	226 (29.5)	200 (26.1)	339 (44.3)					

Table 70: Lin.

71 Short-Term Clinical Outcomes of Heart Failure Patients Discharged from the ED Within an Integrated Healthcare Delivery System

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Background: Nationally, 80% of patients presenting to an ED with heart failure (HF) are admitted. Admission decisions for HF patients are complex, and highly variable across US hospitals. Understanding outcomes of discharged patients may be useful to identify the subset of patients for safe outpatient management. Prior studies have reported 11% and 19% admission rates within 7 and 30 days, respectively, of an index ED visit for management of acute HF, and 1.3% and 4% mortality rates at 7 and 30 days, respectively.

Objectives: To characterize 3, 7 and 30-day rates of ED re-visit, hospital admission and death of patients discharged from an ED after care for acute HF in a large integrated healthcare delivery system. We also examined rates of outpatient follow up within 7 days.

Methods: We identified all adult members of Kaiser Permanente Northern California who were discharged from an ED with a coded diagnosis of HF between January 2013 and September 2014. Patients who left against medical advice or eloped were excluded. We used health plan electronic medical records to ascertain ED visits and hospitalizations and comprehensive mortality files to identify deaths within 3, 7 days and 30 days. We also measured rates of outpatient follow up within 7 days using health plan databases.

Results: A total of 8,749 eligible patients from 21 medical centers were identified, with mean age 77 years and 52% women. We observed 5.4%, 12.9% and 36.7% of patients had an adverse event (composite outcome of ED visit, admission or death) within 3, 7 and 30 days, respectively (Figure 1). Overall, 4.6% and 13.1% of patients were admitted within 7 and 30 days, respectively, and 1.3% and 3.9% died within 7 and 30 days, respectively. Of note, 52% of patients had outpatient follow up within 7 days.

Conclusion: Within a large, diverse community-based population of adults receiving ED care for HF in an integrated healthcare delivery system, rates of post-discharge adverse events were lower (hospitalization) than previously reported, but still represent significant opportunities for improvement in quality of care by determining modifiable factors associated with these adverse events.

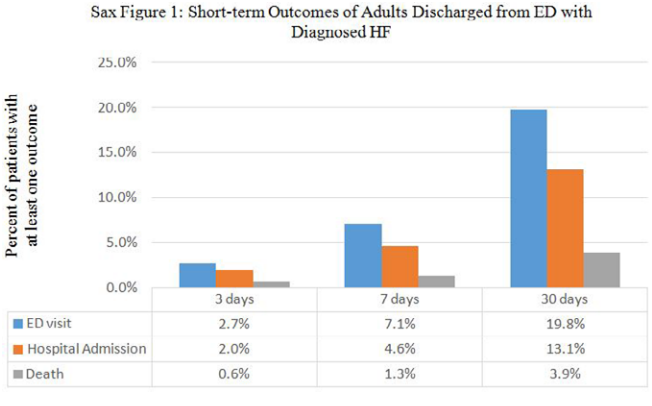

Figure 71 – Sax

72 Comparison of the Rate of Missed Myocardial Infarctions in ED Patients Categorized as Low-Risk by Heart, TIMI, and Grace Scores

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Background: Many risk stratification tools are used for evaluating suspected acute coronary syndromes (ACS). Most demonstrate very low rates of missed AMI when categorized as low risk by HEART, TIMI, and GRACE scores. However few studies have compared these scoring systems using a variety of contemporary troponins.

Objectives: To compare the rate of missed AMI in ED patients with suspected ACS categorized as low risk by HEART, TIMI, and GRACE scores as well as general gestalt.

Methods: *Study Design:* Prospective, multi-center, observational study. *Setting*: 7 EDs with annual census of 50,000 to 125,000. *Patients:* Adult patients with suspected ACS in whom a troponin (I or T) was obtained. *Measures:* Demographic, clinical, electrocardiographic, and lab data were collected by research staff, including clinical suspicion of AMI (low, medium and high). Scores were calculated and low risk was defined as HEART<4, TIMI<2, GRACE<101, and EDACS <16. *Outcome:* Diagnosis was determined by adjudicators blinded to risk scores and using the Third Universal Definition for AMI. *Data Analysis*: The incidence of AMI was calculated for each score's risk level. The missed MI rates in low risk patients were compared using 95% confidence intervals.

Results: Overall, 458 were enrolled, with a mean (SD) age of 57 (13), 58% male, 60% white, 29% black, 9% Hispanic, and 82 (18%) were diagnosed with MI. There were 87 (19%) excluded because they had no history evaluation, no ECG, no troponin or no diagnosis. Of the 371 included cases, 71 (19%) were diagnosed with AMI, and ED suspicion of MI was high in 19% and moderate in 44%. AMI rates by individual scores and overall clinical suspicion are presented in the Table. *(see Singer Table 1)* The missed rates of AMI in low risk patients were 4% for HEART (95% CI 2-9), 8% for TIMI (95% CI 4-14), 14% for GRACE (95% CI 10-19), 16% for EDACS (95% CI 12-21), and 6% for clinical suspicion (95% CI 3-12); P<0.001.

Conclusion: The rate of missed AMIs in ED patients with chest pain categorized as low risk by HEART, TIMI, GRACE and EDACS scores as well as clinical suspicion, using a variety of contemporary troponin assays, was higher than previously published. The decision to discharge should not be based on these scores alone.

HEART score	N	% AMI
0	3	0
1	23	4
2	46	0
3	75	8
4	98	10
5	73	22
6	29	66
7	14	71
8	9	89
9	0	-
10	1	100
TIMI score	N	% AMI
0	33	9
1	105	8
2	108	19
3	78	31
4	39	33
5	8	25
GRACE score	N	%AMI
<101	242	14
101-170	120	29
171+	5	40
Clinical suspicion	N	%AMI
Low	136	6
Moderate	164	17
High	71	51

Singer Table 1

Figure 72 – Singer

73 Medication Adherence in the Emergency Department: What are the Barriers?

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Background: Poor medication adherence may lead to clinical deterioration and increased utilization of emergency services. Patients may encounter medication adherence issues due to memory difficulties, lack of funds, and poor insight. In many cases, the ED serves as a terminal resource for those patients who lack critical access to medications.

Objectives: This study aims to evaluate the barriers to medication access and adherence among ED patients.

Methods: We conducted a survey-based observational study among a convenience sample of patients presenting to 2 academic emergency departments from April 2015 to October 2015. Demographic data were collected and questions were asked that assessed medication knowledge, physician-patient communication, and reasons for poor adherence.

Results: Of the patients approached, 454/476 (95%) were enrolled. This population was 52% male, with a median age range of 45-49 years and a median income of < $20,000/year. Among respondents, 40.5% reported going without their medications for at least 3 days, with 11.8% going without their medications for ≥1 month. The common reasons for poor adherence (in descending order) were "I didn't think I needed them", "I forgot", "I ran out", and "insurance." Only 56.3% of patients told their primary care physician (PCP) when they stopped taking their medications. Similarly, 51.9% of those who cut their pills to prolong their prescription (11.3%) failed to tell their PCP. Many reported a recent change of insurance (23.1%), with 61.1% stating that this change made it easier to obtain their medications. However, of those who were forced to change their medications due to their new insurance (27%), most interpreted this as negative (73.1%). Among all patients, 20.2% reported going to the ED over the past year due to running out of their medications or due to problems with their medications.

Conclusion: There is a large population of ED patients who have difficulties with medication adherence. Many are off of their medications for long durations, often due to a poor understanding of the importance of these medications. Many patients fail to inform their PCP when they stop taking their medications or when they cut their pills. Future studies are needed to assess opportunities to improve medication-related patient education, communication, and access.

74 Does a Brief Intervention Reduce Drug Use and Increase Drug Treatment Utilization Among Adult Emergency Department Patients Over a One-Year Period?

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Background: Emergency departments (EDs) commonly serve adult patients with drug use problems, yet evidence-based interventions to assist these patients have yet to be identified.

Objectives: Assess the twelve-month efficacy of a brief intervention (BI) to reduce drug misuse and increase drug treatment services utilization among adult ED patients.

Methods: This randomized, controlled trial was conducted at two US urban, academic EDs. We enrolled 18-64-year-old English- or Spanish speaking patients whose responses to the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) indicated a need for a brief or more intensive intervention for their drug use. Participants in the treatment arm received a tailored BI, while the control arm only completed study questionnaires. Multiple imputations were used to compensate for missing data. We compared participant-reported past 90-day drug use and treatment services utilization by study arm to baseline enrollment at three-month intervals over one year. Generalized linear models and general estimating equations (GEE) were used to identify differences over time between the control and treatment arms, adjusting for baseline ASSIST score, whether or not a booster call was received or an intensive intervention rather than a BI might be needed.

Results: Of the 1,030 participants, their median age was 30 years-old (IQR 24-42); 46% were female and 57% were non-Hispanic white. Most commonly used drugs were marijuana, prescription opioids, cocaine/crack and benzodiazepines. Although there were decreases in reported drug use in both study arms over time, there were no differences between study arms in any past 90-day drug use for all drugs including (β-0.1; 95% CI: -.04, 0.3) or excluding marijuana (β-0.1; 95% CI: -.04, 0.2). In addition, at follow-up there were no differences between study arms in those who were engaged in any drug treatment program in the past 90-days (β 0.1; 95% CI: -.03, 0.4).

Conclusion: This BI was not more efficacious than no BI in reducing drug use or increasing drug treatment utilization over a twelve-month period. Our adult ED patients need other interventions to assist them in combating their drug use.

75 Physician Perceptions of Disease States and Death

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Background: Physicians are often called upon to help patients and families make decisions regarding goals of care and end of life issues. These decisions are often complex and difficult for patients and families to understand. In other circumstances, physicians need to be surrogate decision makers for patients in acute life threatening situations. In both cases, it is imperative that physicians at least understand the patient's relative beliefs on health states. A few studies have looked at laypersons' perceptions of health states, however no study has compared this perception to that of physicians.

Objectives: The objective of this study is to determine whether physicians and laypersons have similar perceptions of health states relative to death.

Methods: We used a category scaling methodology to allow physicians to show relationships between health states including perfect health and death. Participants were asked to place multiple health states on a 100-point scale. Health states were compared to a death state and converted to a -1 to 1 scale. The first set of health states was the same as was used in a previously published cohort of lay people. The second set was a new group of health states developed for this project. Student's T test was used to compare means and standard deviations between current and published participants. ANOVA with post hoc analysis was used to differentiate results in the second set of health states.

Results: A total of 32 physicians participated in the study. Physicians had a statistically different perception of chronic pain (0.00 vs. 0.28, p=0.01), and a trend towards differences in perception of dementia (-0.04 vs. 0.08, p=0.07) and coma (-0.18 vs. -0.09, p=0.14). Of the 13 health states evaluated in the second group, only "need for feeding tube" (p<0.01) and "inability to walk long distances without shortness of breath or chest pain" (p<0.01) were perceived significantly better than death by physicians.

Conclusion: This data suggests that physician and layperson perception of disease states are not completely aligned. This discrepancy may have an impact on shared decision making, especially in the acute care setting. Further work needs to be done to determine the impact of this discrepancy on patients and their healthcare decisions.

76 ED Visits and Patient-Reported Quality of Life

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Background: A growing share of acute care visits take place in hospital EDs. Policy-makers represent such visits as failures of the healthcare system while patients suggest ED visits are the result of informed decision-making to resolve healthcare crises. Although repeat ED visits and hospital readmissions are intensely scrutinized, the impact of ED visits on patients' quality of life (QoL) is unexplored. This is a critical gap given this relation may contribute to a cycle of hospital-based crisis care.

Objectives: To determine 1: the impact of an ED visit on patient-reported QoL; and 2: the effect of an intervention designed to help patients navigate the healthcare system after an ED visit on QoL.

Methods: Medicare Fee-For-Service ED patients with at least 1 comorbidity were randomly assigned in a blinded manner to Usual Care (n=499) or ED-to-Home Intervention Groups (n=502) at two diverse EDs. Usual Care consisted of written and verbal discharge instructions while Intervention participants also received a home visit and follow-up phone calls from a trained healthcare coach. Baseline and follow-up NIH Patient-Reported Outcomes Measurement Information System (PROMIS) QoL domains included physical burden, anxiety, and informational support.

Results: All patients reported worsening physical function, anxiety and informational support in the 30 days after the ED visit. There were no between-group differences in physical burden or anxiety. The decline in informational support reported in Usual Care participants was significantly attenuated in the Intervention Group (see Carden Table 1).

Conclusion: Patient-reported QoL is highest at the time of the ED visit and falls following the encounter. These findings suggest patients will continue to make ED visits to resolve healthcare crises. An ED intervention deployed to assist patients' transition from ED-to-home significantly improves perceived informational support. An ED-to-Home Intervention may impact patients' ability to obtain and use

Carden Table 1: Impact of ED Visit on Patient-Reported Quality of Life

Within-Group Differences in Quality of Life (Follow-up minus Baseline Values)

	Domain	10th	25th	50th	75th	90th	p-value*
Usual Care (n=499)	Physical Burden	-1.0	-0.4	0	0.6	1.4	<0.01
	Anxiety	-1.0	-0.5	0	0.6	1.1	0.46
	Informational Support	-2.0	-1.0	-0.2	0.4	1.0	<0.01
Intervention (n=502)	Physical Burden	-0.9	-0.3	0.1	0.7	1.3	<0.01
	Anxiety	-0.9	-0.4	0	0.6	1.4	<0.01
	Informational Support	-1.4	-0.7	0	0.4	1.2	0.10

*Wilcoxon Sign-Rank test
**Percentile

Between-Group Differences in Quality of Life

Domain	Assignment	p-value***
Physical Burden	Usual Care	**0.53**
	Intervention	
Anxiety	Usual Care	**0.18**
	Intervention	
Informational Support	Usual Care	**0.03**
	Intervention	

***Kruskal-Wallistest

Table 76: Balakrishnan.

health information and healthcare services, including hospital-based ED care.

77 Comparison of Biomarkers in Patients with Acute Submassive Pulmonary Embolism Treated with Fibrinolysis vs. Placebo at Three-Month Follow-Up

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Background: Previous studies have demonstrated the acute inflammatory nature of pulmonary embolism (PE), which may amplify the coagulation axis and increase risk of VTE recurrence.

Objectives: This study aims to examine the presence of inflammatory and hemostatic biomarkers in acute submassive PE and to determine whether treatment with fibrinolysis resulted in significant differences in these markers at three-month follow-up.

Methods: This was a secondary analysis of a multicenter, randomized controlled trial with inclusion criteria as follows: (i) age > 17 years; (ii) PE diagnosed on CTPA performed within 24 h; and (iii) normal arterial systolic blood pressure with evidence of RV strain. Blood samples were obtained from study participants both during their initial presentation with acute PE (prior to administration of treatment) and at three-month follow-up. Inflammatory (IL-6, CRP, MPO) and hemostatic (PAI-1, fibrinogen and D-dimer) biomarkers were quantified and statistical analysis with the unpaired t-test was performed.

Table: Biomarkers in PE at Enrollment and Three-month Follow-up

	Enrollment	Follow-up	%, (P paired t)
IL-6 (pg/ml)			
Placebo	29.1	4.9	83%, (0.014)
TNK	35.5	4.4	88%, (0.002)
Unpaired t	0.630	0.679	----------
CRP (ng/ml)			
Placebo	24258	9633	60%, (0.007)
TNK	37781	6188	84%, (0.000)
Unpaired t	0.104	0.141	----------
MPO (pg/ml)			
Placebo	378	72	81%, (0.000)
TNK	287	76	74%, (0.000)
Unpaired t	0.177	0.911	----------
PAI-1 (pg/ml)			
Placebo	2649	3339	-26%, (0.073)
TNK	2054	3315	-61%, (0.041)
Unpaired t	0.245	0.969	----------
Fibrinogen (mg/dl)			
Placebo	407	400	2%, (0.472)
TNK	418	406	3%, (0.840)
Unpaired t	0.754	0.789	----------
D-dimer (ug/ml)			
Placebo	6.21	0.73	88%, (0.000)
TNK	7.02	0.37	95%, (0.000)
Unpaired t	0.490	0.037	----------

Table 77: Stewart.

Results: This analysis included 60 patients (31 tenecteplase and 29 placebo). All biomarkers of inflammation (IL-6, CRP, MPO) were significantly higher at initial enrollment than three-month follow-up, with time after PE resulting in a 60-88% decrease in absolute concentration of these markers. Concentrations of PAI-1 and fibrinogen were not significantly changed with time after PE. Treatment with tenecteplase was associated with a significantly reduced D-dimer concentration at three months vs. placebo (95% reduction vs. 88%, p = 0.037). Fibrinolysis was also associated with relatively larger decreases in IL-6 (88% vs. 83%) and CRP (84% vs. 60%), although these were not statistically significant.

Conclusion: This study re-emphasizes the highly acute inflammatory nature of PE, as time after initial clot had a larger overall effect on the reduction of inflammatory markers than hemostatic markers. It also suggests treatment with fibrinolysis to be associated with significantly lower D-dimer concentrations three months later. A normal convalescent D-dimer has been previously shown to be a powerful predictor of no VTE recurrence. These findings provide biological support for the observation on multiple recent systematic reviews showing that fibrinolysis is associated with lower VTE recurrence rates.

78 High-Density Lipoproteins (HDL) as a Negative Regulator of Innate Immunity

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Background: Sepsis remains a major cause of death in the intensive care unit, annually claiming >225,000 victims in the U.S. alone. The pathogenesis of sepsis remains poorly understood, but is partly attributable to dysregulated inflammatory responses sustained by proinflammatory mediators [e.g., high mobility group box-1 (HMGB1) and serum amyloid A (SAA) proteins]. Within the water-based blood stream, high density lipoproteins (HDL) carry cholesterol, triglycerides and phospholipids, and can capture SAA to facilitate its removal by the liver. However, circulating HDL levels are often reduced in septic patients, and the magnitude of this reduction is positively correlated with the severity of the illness. It was previously unknown whether HDL also affects SAA- or HMGB1-induced inflammatory responses.

Objectives: To evaluate the anti-inflammatory properties of HDL, we examined whether HDL attenuates SAA- or HMGB1-induced release of various proinflammatory cytokines or chemokines in macrophage cultures.

Methods: Murine macrophage-like RAW 264.7 cells or primary murine peritoneal macrophages were stimulated with recombinant SAA

(1.0 μg/ml) or HMGB1 (2.0 μg/ml) either alone or in the presence of HDL (Cat. No. L8039, Sigma-Aldrich; 0-100 μg/ml), and the extracellular levels of various cytokines were determined by Western blotting analysis or Cytokine Antibody Arrays, respectively.

Results: At physiologically relevant concentrations (100 μg/ml), HDL almost completely blocked the SAA-induced release of HMGB1 and group II 14 kDa secretory phospholipase A2 (sPLA2) by primary macrophages. Similarly, HDL (50 μg/ml) dramatically inhibited HMGB1-induced release of chemokines (e.g., MCP-1 and RANTES) by macrophage-like RAW 264.7 cells.

Conclusion: HDL serves as a negative regulator of important mediators of lethal sepsis, and possibly occupies an essential role in counter-regulating innate immune responses during sepsis and other inflammatory conditions.

79 Scholarly Productivity and Impact: Developing a Quantifiable, Norm-Based Benchmark for Academic Emergency Departments

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Background: Historically, benchmarking the scholarly productivity of an academic emergency department (AED) and individual emergency medicine (EM) investigators has been challenging because of a lack of a standardized metric or appropriate normative reference.

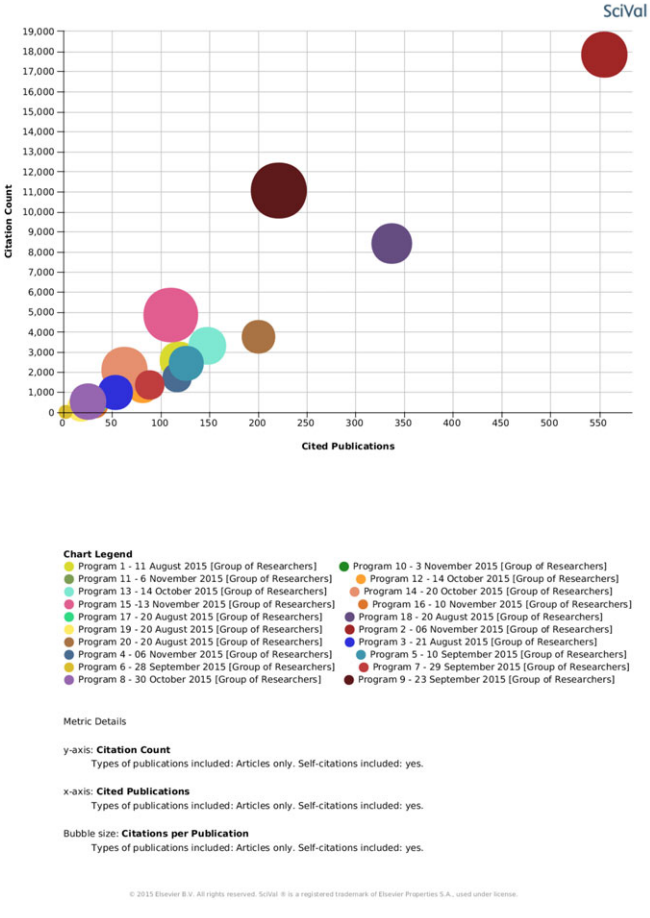

Figure 79 – Boudreaux

Objectives: To develop a systematic, benchmarking method that measures the scholarly productivity (publications over time) AND impact (citations, cited publications, and citations per publication over time) of an AED and individual EM investigator against normative reference groups.

Methods: All AEDs in the United States were identified through the Society for Academic Emergency Medicine (SAEM) website (n=196). Every faculty member working in each AED was documented in a database using each AED's website. Scopus, an abstract and citation database for peer-reviewed literature, was used to identify all publications for each investigator. Investigators and their respective AED were then entered into SciVal, a research intelligence tool that analyzes bibliometric data based on output and usage from Scopus. The SciVal corpus, including all AEDs, EM investigators, and their scholarly productivity and impact metrics, was downloaded into a database. This database can be used to derive percentile rank for each AED or investigator against normative groups keyed to a range of user-selected constraints, including geography, academic ranking, and years since terminal degree.

Results: SAEM listed a total of 196 AEDs. After eliminating programs for whom faculty lists were not publically available, 183 programs, or 93% of those listed by SAEM, remained. This yielded a total of 5,843 individual EM faculty members, all of whom were entered into the benchmarking database. From the years 2003-2013, average scholarly output per AED was 12.23 ± 12.96 peer reviewed publications. The average peer reviewed journal output per EM investigator was 2.14 ± 2.12. A random sampling of 20 AED's were drawn and benchmarked against one another for publications/year and impact/year to demonstrate performance visually (Figure 1).

Conclusion: Our method has the potential to transform the field of academic EM by benchmarking performance against other similar departments (i.e., AEDs) and investigators. This has important implications for review of individual AEDs and investigators.

80 Emergency Medicine Milestones: Statistical Approaches to Agreement

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Background: The EM Milestones are a set of 23 benchmarks developed by EM experts for the Accreditation Council for Graduate Medical Education to assess competency-based developmental outcomes of postgraduate trainees.

Objectives: To describe appropriate statistical approaches that can be used to assess the consistency between the self-evaluations made by residents with their faculty advisors' assessments using the milestones at a single time point.

Methods: We collected milestone scores of 42 postgraduate year (PGY-1 to PGY-4) EM residents training at one urban, academic medical center for the spring of 2014. We matched residents' self-evaluation scores to their corresponding faculty evaluation scores (based upon consensus reached by a team of senior supervisory faculty). Each milestone question was scored using an ordinal scale ranging from 1 to 5 with half points for a total of 9 possible categories. Simple and quadratically-weighted Cohen's kappa were used to assess agreement and association between pairs of scores made using an ordered scale, and a Concordance Correlation Coefficient (CCC) assessed agreement for scores made using a continuous scale.

Results: The simple Cohen's kappa of agreement ranged from 0.01 - 0.42, indicating slight to moderate chance-corrected agreement. The quadratically-weighted kappa yielded a range of 0.43 - 0.88, indicating moderate to strong chance-corrected association. The milestone assessing competence with vascular access (PC14) had the highest quadratically-weighted kappa value at 0.88 (95% CI 0.81 - 0.94), indicating almost perfect chance-corrected association, while the

milestone assessing goal-directed focused ultrasound (PC12) had the lowest quadratically-weighted kappa value at 0.43 (95% CI 0.20 - 0.65), indicating only fair chance-corrected association. The CCCs yielded almost identical values to Cohen's weighted quadratic kappa for every question.

Conclusion: The large number of categories in the ordered scoring scale led to low values of exact, perfect agreement (simple Cohen's kappa) between residents and faculty evaluations. The quadratically-weighted kappa was an appropriate measure of chance-corrected associations when pairs of residents and faculty evaluations are weighted according to how closely they agree.

81 Development of an Emergency Medicine Simulation Fellowship Consensus Curriculum: Initiative of the Society for Academic Emergency Medicine Simulation Academy

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Background: Although there has been a recent explosion of simulation fellowship training, there is currently no consensus on the core competencies required at the completion of an Emergency Medicine (EM) Simulation Fellowship.

Objectives: 1. Develop a set of consensus guidelines for EM Simulation Fellowships on behalf of the Society of Academic Emergency Medicine Simulation Academy. 2. Provide general guidelines for individualized curriculum development. 3. Outline the critical components of an EM Simulation Fellowship.

Methods: The process for content validation of curriculum guidelines proposed by Cumyn and Harris was used as the conceptual framework. This entailed delineation of curriculum content, validation of curriculum content using survey methodology, and obtaining consensus on modifications using the Delphi method. EM simulation fellowship curricula were collected, with analysis by 2 independent reviewers per curriculum. Content themes and curricular components were identified. 30 fellowship directors were then surveyed and asked to indicate if each component should be included, modified or deleted, with opportunity to provide justification. A free-marginal kappa with a cutoff of 0.7 was used to indicate sufficient interrater agreement. Items without agreement were compiled into a second survey utilizing a 10 point Likert scale. Items which fell into the 8-10 point category greater than 66% of the time were considered essential elements.

Results: The committee collected and analyzed 20 simulation fellowship curricula. Twenty fellowship directors/experts responded to the initial survey and consensus was reached to retain 37 of 64 elements. The remaining items were reworked and distributed in survey round two. 10 of those curricular elements were deemed essential. The final proposed curriculum guidelines containing 47 elements in 9 categories were posted to the Simulation Academy Executive Board for edits and approval (Image 1).

Conclusion: A standardized process was successfully used to outline a set of consensus guidelines for EM simulation fellowships. We hope this will facilitate a shared mental model and provide a guide for current and future simulation fellowships.

Simulation Fellowship Curriculum Content Categories

Content Category	Number of Consensus Items
Simulation Curriculum Development	6
Technical Operations and Techniques	8
Simulation Directorship/Administrative	6
Simulation Research	3
Simulation Fellowship Teaching and Education	9
Simulation Theory	5
Assessment of the Fellow	5
Evaluation of the Fellowship Program by the Fellow	2
Other Common Topics	3

Figure 81 – Fralliccardi

82 A Novel Adsorbent System Rapidly Clears Amlodipine from Human Blood

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Background: Calcium channel blockers are not effectively removed by current extracorporeal removal techniques, such as hemodialysis or charcoal hemoperfusion. CytoSorb is a perfusion cartridge containing a novel sorbent polymer, approved and marketed in Europe for the removal of excess cytokines in sepsis.

Objectives: To determine whether a cartridge containing polymeric beads can efficiently clear amlodipine from human blood.

Methods: 20 mg amlodipine was added to 4 liters of citrate-anticoagulated whole human blood and stirred to equilibrate. This blood was then recirculated through a Cole-Parmer Masterflex L/S Digital Drive blood circuit at a rate of 300 mL/minute. In the experimental arm, a saline-primed 300-mL CytoSorb cartridge was installed in-line with the circuit. Whole blood samples were obtained prior to amlodipine instillation, following equilibration, and after 0, 15, 30, 60, 120, and 180 minutes of blood recirculation. Whole blood amlodipine concentrations were determined using previously-validated ultra performance liquid chromatography methods. The lower level of quantification (LLQ) was 0.25 mg/L whole blood. Two experimental and two control runs were performed.

Results: All quality control checks were within 15% of their respective nominal values. At the start of recirculation, whole blood amlodipine concentrations were 5.44 (+/-0.63) mg/L in the experimental and 4.70 (+/-0.16) mg/L in the control arms. In the experimental arm, amlodipine concentrations were 3.20 (+/-0.42) mg/L after 15 minutes of recirculation, 1.93 (+/-0.15) mg/L at 30 minutes, 1.02 (+/-0.36) mg/L at 60 minutes, 0.62 (+/-0.15) mg/L at 120 minutes, and 0.35 (+/-0.12) mg/L after 180 minutes. Amlodipine removal was therefore 41.3% after 15 minutes of perfusion, 64.6% after 30 minutes, 81.3% after 60 minutes, 88.7% after 120 minutes, and 93.5% after 180 minutes of recirculation. Amlodipine concentrations in the control arms were 107.2% of baseline after 180 minutes.

Conclusion: Perfusion over polymer beads efficiently removes amlodipine from whole human blood.

83 Associations of Emergency Department Length-of-Stay with Publicly Reported Quality-of-Care Measures

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Background: The Institute of Medicine identified emergency department (ED) crowding as a top public health problem. Prior research on the impact of ED crowding is limited to reports from small hospital cohorts.

Objectives: The Centers for Medicare Services (CMS) began 'pay-for-reporting' of ED timeliness measures in 2012. We assess the links between publicly reported ED length-of-stay (LOS) and quality-of-care measures in a national cohort of hospitals.

Methods: We analyzed 2012-2013 data from the CMS Hospital Compare program. We included hospitals that reported ED LOS for both years and excluded specialty, Veterans Affairs, and children's hospitals. The unit of analysis was the hospital, and all measures are reported at the hospital annual median value. Dependent measures included satisfaction ratings, time to pain management in bone fracture, left without-being-seen (LWBS) rates, 30-day hospital wide readmissions, and time to STEMI revascularization. The independent variable was ED LOS. To control for invariant hospital level unobservable factors, we used fixed-differences regression models. This approach models the with-in hospital change of all variables from 2012 to 2013. We used a published risk adjustment model to control for changes in ED volume, hospital admission, Medicare case mix index, and other hospital characteristics. Because of non-normal data distribution, LWBS was modeled with an ordinal logistic regression (decrease, no change, increase). All other outcomes were modeled with an identity link.

Results: We studied 2,614 hospitals. Each additional hour of ED LOS was associated with -0.7% proportion of patients giving a top satisfaction rating, -0.7% proportion of patients who would "definitely recommend" the hospital, and +6 minutes to pain management for long bone fracture. ($p<0.001$) Increased ED LOS was associated with higher levels of LWBS (OR 1.4, 95CI 1.2-1.7). ED LOS was not associated with hospital readmissions or time to revascularization. ($p>0.6$)

Conclusion: In this national sample, ED LOS is associated with small but significant changes in patient satisfaction, pain management, and LWBS. ED timeliness appears to have important impact on patient experience and access. We did not find significant associations between ED timeliness and selected safety measures.

84 Why Wait? An Econometric Analysis of the Supply of Emergency Department Care

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Background: Despite substantial policy attention focused on reducing demand for ED services, ED wait times continue to increase. An extensive literature documents interventions to improve ED flow, but they remain under-adopted. The reason that economic forces have not increased the supply side of emergency care in order to decrease wait times remains unexamined.

Objectives: We hypothesized that the uninsured affect the supply of ED services, but that EDs do not discriminate against individual uninsured patients.

Methods: We used a 2.5% sample of the 2005-11 State Emergency Department Databases for MA and NJ, and a novel, validated dataset of estimated wait times for each visit. Linear regression assessed the effect of hospital uninsurance status on wait times and total ED length-of-stay, controlling for detailed diagnosis (ICD9-CM), demographic indicators, contemporaneous volume of visits to the same ED, and individual insurance status. The ED's uninsurance rate was instrumented with the county's uninsurance rate. Standard errors were block bootstrapped by hospital.

Results: Over 340,000 visits to 157 hospitals, ED uninsurance rates ranged from 3% to 53%, a 50 percentage point (pp) range. Instrumental variable analysis demonstrated that a 50pp decrease in the ED uninsurance rate caused a 37.2-minute decrease in wait times ($p<0.01$) and a 59.9-minute decrease in total length-of-stay ($p=0.06$). Controlling for hospital uninsurance rate, individual uninsurance rate was uncorrelated with wait times (0.24-minute lower wait, $p=0.99$). The instrument was necessary (Hausman $p<0.01$) and strong (correlation of 0.78).

Conclusion: Hospitals that see fewer uninsured patients have lower wait times as a direct result, but insured patients do not wait less at a given hospital. Providing insurance to the uninsured therefore may have a large, positive spillover effect on insured patients in EDs. States that expand Medicaid should see reduced ED wait times, even if expansion initially causes more visits to the ED.

85 Emergency Department Visits Post-Joint Replacement in an Era of Mandatory Bundled Payments

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Background: Beginning April 1, 2016, approximately 800 hospitals across 67 metropolitan statistical areas (MSAs) will be held accountable for the quality of care they deliver to Medicare beneficiaries through the Comprehensive Care for Joint Replacements (CJR) program. Under the program, the episode of care will begin with admission to a participating hospital and ends 90 days post-discharge and total expenditures for both Medicare Part A and B (with few exceptions) will be compared to the Medicare target episode price. Thus expenditures for all ED visits within the defined episodes will be included. To date, little research has been done to identify the frequency and associated diagnoses for ED visits within a full 90 days of discharge for Medicare beneficiaries undergoing Total Elective Joint Replacement.

Objectives: 1. To identify the frequency of ED visits for cases that would qualify for inclusion in the CJR; 2. To identify differences between patients undergoing total hip replacement vs. total knee replacement.

Methods: We used the Medicare MEDPAR and the 100% Outpatient SAF Research Identified File for Texas 2009-2011 to identify cases that would qualify for inclusion under a bundled payment for Lower Extremity Joint Replacement (LEJR). Analysis of both distribution by principal diagnosis and frequency of ED visits were completed for cases undergoing qualifying procedures.

Results: A total of 18,719 cases of total hip replacement qualified for inclusion. 4,167 ED visits occurred with 90 days of surgery (22%) and 2084 visits did not result in readmission (10.1%). 4,653 ED visits occurred in 30,386 total knee replacements (15.3%) and of these 2903 did not result in admission (9.6%.)

Conclusion: We have found that the rates of ED visits post-total joint replacement varies between hip and knee procedures. A surprising number of visits were identified that did not result in readmission. It is imperative that emergency medicine researchers study the causes of these visits as well as the cost in order to guide physicians in managing these visits.

86 TeleHealth in Emergency Medicine: A Descriptive Analysis

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Background: TeleHealth is an emerging field and has few large population studies published to date.

Objectives: Our objective was to describe a cohort of a large, mature TelEmergency (TE) program.

Methods: Consults from an academic TE program consisting of 14 remote rural sites were recorded by the emergency medicine physician in real time via paper log and later incorporated into an electronic database. Demographics, diagnosis, and disposition were required documentation for all patients, while past medical history (PMH) details were abstracted when available. All patients with a documented consult from March 2011 to March 2014 were included. Diagnoses were categorized into ontologies for comparison. Demographics, dispositions, and ontologies were characterized as a whole. TE consults were then categorized by disposition, and demographics, PMH, and ontologies were compared between the subgroups. x^2 and Fisher exact tests were used as appropriate with $p < 0.05$ considered statistically significant.

Results: 4,188 TE consults were included in this analysis. The median age was 50 years, 44% were African American, and 55% were Caucasian. 41% of patients were discharged to home, 34% transferred to another facility, and 23% admitted locally. The top 4 ontologies prompting a consult were chest pain (11%), blunt trauma (7%), abdominal pain (6%), and syncope (4%). PMH was available on 1,449 patients. Of those, 24% had HTN, 16% DM, 13% CAD, 9% CHF, 8% COPD, 7% malignancy, 6% CVA and 6% MI. Admitted patients were older (median age 64 years) than those discharged to home (median age 36 years) or transferred to another facility (median age 53 years, $p = 0.0001$). Admitted patients were more often female (55%), while patients who died in the ED or left against medical advice were more often male (64% and 55%, respectively, $p = 0.003$). Admitted patients more often had a PMH of COPD ($p = 0.001$), while transferred patients more often had a PMH of CVA ($p = 0.0002$). Few patients with PMH of CAD, MI or CHF were discharged ($p = 0.002$). Chest pain was the top ontology in all subgroups.

Conclusion: In a mature TE program, the most common ontologies prompting consultation were chest pain, blunt trauma, and abdominal pain with many patients requiring admission or transfer. These data may be useful to programs attempting to determine staffing for a Tele-emergency program.

87 Is Ultrasound Non-Inferior to Computed Tomography for Pediatric Appendicitis?

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Background: Appendicitis is the most common pediatric surgical emergency. The diagnosis is most commonly made by computed tomography (CT) or ultrasound (U/S). CT radiation-induced malignancy concerns warrant further evaluation of U/S as the first-line diagnostic modality for suspected appendicitis.

Objectives: We evaluated the accuracy of U/S compared to CT for the diagnosis of pediatric appendicitis in a 21-hospital system.

Methods: We conducted a retrospective study of all patients age 2-17 years seen in the ED who underwent non-incidental appendectomies from 2006 2015, and analyzed ED imaging use, patient characteristics and surgical outcomes. We compared negative appendectomy rates (NAR) for CT and U/S, using a 3% non-inferiority margin between CT and U/S groups. We performed six non-inferiority tests: among the full cohort; among all males and all females; and among subjects aged 2-5 years, 6-10 years and 11-17 years. Our alpha for each one-sided test was p=0.008, correcting for multiple comparisons (0.05/6=0.008). Patients with no imaging and those undergoing U/S followed by CT were excluded from analysis to minimize confounding by imaging indication.

Results: Of 6169 subjects, CT alone was performed in 30.4% (1873) and U/S alone in 29.7% (1832). The NAR was 4.9% (92) for CT and 7.2% (132) for U/S. Patients undergoing no imaging (26.6%; 1644) and those having both U/S and CT (13.4%; 829) had NARs of 4.3% (70) and 7.8% (64) respectively. Among male patients U/S was non-inferior to CT (NAR 5.1% vs 4.7%, p=0.003). U/S did not achieve non-inferiority to CT among all patients (p=0.19), among females (10.2% vs 5.3%, p=0.92), or in the age groups (2-5 years [16.6% vs. 5.3%, p=0.95], 6-10 years [6.4% vs 4.7%, p=0.18], or 11-17 years [6.5% vs 4.9%, p=0.07]).

Conclusion: In our analysis, U/S was non-inferior to CT for negative appendectomy among male pediatric patients, further supporting the first-line use of U/S in age and gender stratified diagnostic pathways for suspected appendicitis. Among females, imaging decisions for suspected appendicitis should balance the risks of negative appendectomy against those of radiation-induced malignancy.

88 The Outcome Predictive Power of Focused Echocardiography in Cardiopulmonary Resuscitation: A Meta-Analysis

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Background: The AHA 2015 guidelines for CPR and ECC recognized the potential benefits of focused transthoracic echocardiography to diagnose potentially reversible causes of cardiac arrest. The diagnostic information provided by echocardiography may be utilized to predict the resuscitation outcomes of patients with cardiac arrest.

Objectives: We conducted a meta-analysis to summarize the evidence regarding the accuracy of focused transthoracic echocardiography to predict outcomes in patients who have sustained cardiac arrest.

Methods: The MEDLINE, EMBASE and the Cochrane Library databases were searched for studies published from inception to October 2015. The medical subject heading (MeSH) and text words for the term "echocardiography" were combined with the MeSH term "cardiopulmonary resuscitation". Exclusion criteria included reviews, letters, editorials, case reports, comments, and animal studies. Two reviewers extracted and verified the data independently. Using a bivariate meta-analysis model with a 95% confidence interval (CI), we calculated the pooled sensitivity, specificity, positive and negative likelihood ratios of focused transthoracic echocardiography to predict Return of Spontaneous Circulation (ROSC), survival to hospital admission, and survival to hospital discharge.

Results: Out of 835 articles identified, 20 studies met the inclusion criteria for further review, and 15 studies contained sufficient data extractable for outcome prediction. The pooled sensitivity, specificity, and positive and negative likelihood ratios were 0.95 (95% CI: 0.68-0.99), 0.77 (95% CI: 0.59-0.88), 4.1 (95% CI: 2.2-7.7) and 0.06 (95% CI: 0.01-0.51) for prediction of ROSC in 9 studies; 0.78 (95% CI: 0.62-0.88), 0.74 (95% CI: 0.62-0.84), 3.0 (95% CI: 2.0-4.7) and 0.30 (95% CI: 0.16-0.54) for prediction of survival to hospital admission in 6 studies; and 0.78 (95% CI: 0.48-0.93), 0.68 (95% CI: 0.44-0.85), 2.4 (95% CI: 1.4-4.3) and 0.33 (95% CI: 0.13-0.81) for prediction of survival to hospital discharge in 5 studies.

Conclusion: Echocardiography should not be utilized independently to predict patient outcome given its poor to moderate positive likelihood ratio. The significantly low negative likelihood ratio in the outcomes across our study groups may help determine response to resuscitation and may assist with appropriate allocation of resuscitation resources.

89 The Diagnostic Utility of Carotid Flow Time Before and After Passive Leg Raise in Identifying Volume Status

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Background: The ability to accurately determine volume status is critical in making a decision regarding fluid resuscitation. Non-invasive bedside ultrasound to measure corrected carotid flow time (FTc) may be an accurate predicator of fluid status.

Objectives: We aimed to determine the optimal cut-off value and diagnostic accuracy of a relative change in FTc before and after passive leg raise (PLR) to predict fluid status.

Methods: We conducted a prospective study of 123 individuals who were in a dehydrated state following a fast of ≥12 hours. FTc measurements were obtained via ultrasound of the carotid artery in the semi-fowler's position, with a repeated measurement following a PLR. Participants were then provided oral fluids, and the FTc measurements were repeated in the non-fasting state. The primary outcome was the optimal cut-off value and the diagnostic accuracy of a relative change in FTc before and after PLR to predict fluid status. The diagnostic utility was determined using logistic regression and ROC analysis.

Results: 123 participants had fasted for an average of 16.9 hours and consumed an average of 933 mL post fasting. Significant increases in mean FTc in the semi-fowler's were observed from the fasting to the non-fasting state (312 ± 22 ms vs. 345 ± 25 ms; P-value <0.001). A larger absolute increase in FTc following a PLR maneuver was observed in the fasting than non-fasting state (24 ± 13 ms vs 3 ± 15 ms; P-value <0.001). The area under the ROC was 0.858 (95% CI 0.811 - 0.905) for relative change in FTc with PLR. The optimal diagnostic cut-off value was determined to ≥5% which was found to be 73% sensitive and 82% specific.

Conclusion: The use of ultrasound to measure FTc provides a non-invasive alternative to measure fluid status. Percent change in FTc of ≥5% before and after PLR, provides strong and reliable diagnostic accuracy for predicting fluid status in a sample of dehydrated participants in fasting state.

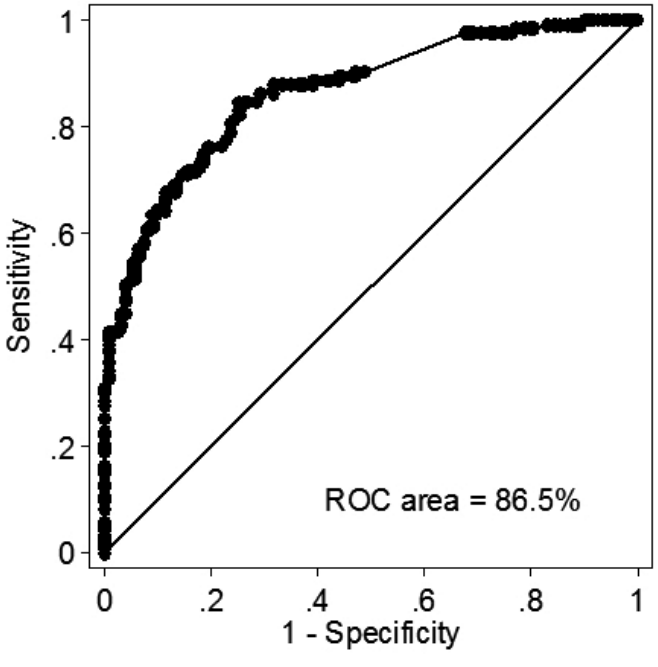

Figure 89 – Shokoohi

90 A Prospective, Randomized Control Trial of Ultrasound Guided Radial Arterial Catheter Placement Versus the Standard Technique by EM Residents

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Background: Arterial cannulation (AC) is often required in critically ill patients for continuous blood pressure monitoring and frequent blood sampling. A previous study demonstrated that ultrasound guided arterial cannulation (USGAC) is a superior method to the traditional technique of landmark based palpation when performed by fully-credentialed ultrasound faculty experts.

Objectives: This study sought to compare traditional AC to USGAC as performed by Emergency Medicine (EM) residents with varying skill levels in ultrasound.

Methods: This was a prospective, randomized, crossover, interventional study, conducted at a tertiary care academic urban emergency department with approximately 70,000 adult visits per year. Over an 18-month (2014-2015) period, patients ≥ 18 years of age requiring AC for continuous blood pressure monitoring or frequent blood draws were randomized to traditional AC or USGAC based on the last digit of the patient's medical record number. Consent was waived by the institutional review board. Subjects were PGY2 and PGY3 EM residents who had undergone basic ultrasound training as according to the 2008 ACEP Emergency Ultrasound Residency Training Pathway. If the technique dictated by randomization was not successful after three attempts, the alternative technique was attempted.

Results: A total of 31 patients were enrolled: 15 in USGAC and 16 in traditional AC. The USGAC technique achieved a higher initial success rate compared to the traditional AC technique (93% v 56%; p <0.01), required fewer attempts (1.4 v. 1.8; N/S) and resulted in fewer complications (40% v. 75%; N/S). Time to successful placement was similar between the two groups (271 seconds versus 261 seconds; N/S). Despite the fact that almost half (47%) of the EM residents randomized to the USGAC group had performed < 10 prior USGACs, they still had a 93% first time success rate. This study is ongoing to obtain an N of 60 to achieve a power of at least 80% to statistically discern observed differences of 15%.

Conclusion: EM Residents with only basic ultrasound training have high success rates with fewer attempts and lower complication rates using USGAC compared to traditional AC.

91 Diagnostic and Prognostic Value of Hydronephrosis in Emergency Department Patients with Acute Renal Colic

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Background: Hydronephrosis is a marker of stone-related ureteral obstruction.

Objectives: To assess the prognostic and diagnostic value of hydronephrosis.

Methods: We used an administrative database to identify all renal colic patients seen in Calgary's four EDs in 2014. Research assistants reviewed imaging reports to identify proven ureteral stones and to document hydronephrosis and stone size. Surgical interventions, ED and hospital visits within 60-days were collated from all regional

hospitals. The primary outcome was sensitivity and specificity of hydronephrosis for detecting stones >5mm. We also assessed the association of hydronephrosis with index admission-intervention, and with 14 and 60 day outcomes.

Results: In 2014, 1828 patients had a confirmed ureteral stone plus assessment of hydronephrosis and stone size (1714 CT, 114 US). Hydronephrosis was absent, mild, moderate or severe in 15%, 47%, 34% and 4% of patients. Median stone size was 4, 4, 5 and 7mm for patients with absent, mild, moderate and severe hydronephrosis. Mild, moderate and severe hydronephrosis were highly associated with admission (OR=2.0, 4.6, 9.8; p<0.001) and index visit surgical intervention (OR=2.1, 3.7, 6.0; p<0.001). Moderate-severe hydronephrosis was 55% sensitive and 65% specific for stones > 5mm, with PPV and NPV of 51% and 74%. Of 1828 patients, 748 had an index visit surgical procedure and 1080 had only medical management. In the latter group, hydronephrosis was absent, mild, moderate or severe in 20%, 50%, 27% and 3%. Corresponding median (IQR) stone size was 3, 4, 4 and 5mm. Of 1080 discharged patients, 19% and 25% had an unscheduled ED revisit by 14 and 60 days, 9% and 10% were hospitalized by 14 and 60 days, and 13% had a rescue procedure within 60 days. In the medically managed group, hydronephrosis had no statistical association with any patient outcomes at 14 or 60 days.

Conclusion: Hydronephrosis has poor sensitivity, specificity and predictive value for stones >5mm. Degree of hydronephrosis is highly associated with MD decisions for admission and intervention, but not with patient outcomes in the absence of these decisions. Despite poor diagnostic and prognostic performance, hydronephrosis is likely guiding critical management decisions.

92 In Support of Choosing Wisely: Variation in CT Ordering for Patients Presenting to Emergency with Minor Head Injury

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Background: Disparities in CT imaging rates have been described across institutions and regions, but the degree of variation among individual emergency physicians is less well-known. We sought to evaluate practice variation in CT imaging by emergency physicians for patients presenting with head injury across eleven hospitals in the province of Alberta.

Objectives: We sought to evaluate variation in CT imaging rates by emergency physicians for patients presenting with head injury.

Methods: A unique data warehouse merging administrative, clinical, and imaging platforms for 11 Alberta emergency departments (EDs) was created. Unique identifiers were obtained for all emergency physicians who were included in this analysis if they evaluated in excess of ten ED patients presenting with a chief complaint of "head injury". Patients with high triage acuity (CTAS 1) were excluded, as were patients who were admitted to hospital. Descriptive statistics were employed to describe variation between physicians and sites over a 24 month period from 2013-2015.

Results: 311 emergency physicians treating 20,797 patient encounters for head injury were included. Overall a total of 8,245 head injury patients (40%) received one or more CT scans. Physician variation in CT ordering across the 11 sites ranged from 4% -100% (see figure for distribution). Within sites CT ordering between physicians varied from 9-fold (4% - 36%) at the lowest variation site, to more than 20-fold (4% - 90%) at the highest variation site. After removing the 5% lowest and highest ordering physicians, variation in ordering continued to range from 10% - 72%. No trends were observed across the two years examined.

Conclusion: This is the largest study to date examining physician level variation in CT ordering practices for ED head injury patients. We have identified marked persistent practice variation despite the presence of well-validated clinical decision rules and a relatively low

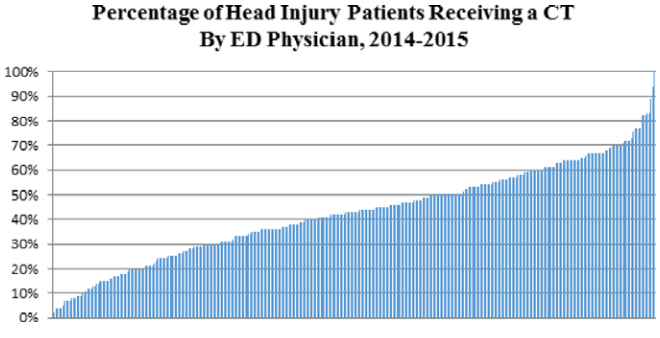

Figure 92 – Grigat

risk medicolegal environment. Variable risk tolerance and limited use of validated clinical decision rules are likely contributors making this area an ideal focus for targeted interventions to improve imaging appropriateness and reduce practice variation.

93 Risk Adjustment Substantially Impacts Emergency Physician CT Utilization Profiling

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Background: Emergency physician (EP) CT utilization metrics are used for quality improvement, cost reduction, and future public reporting. To date, these measures have not been risk-adjusted and little is known about how risk adjustment affects profiles of physician resource use.

Objectives: We sought to evaluate the impact of risk-adjustment on provider-level profiling of emergency physician CT imaging use.

Methods: We conducted a cross-sectional analysis of all ED visits at 4 EDs in a single health system between 10/2013 and 10/2014 using electronic health record data. CT imaging studies were attributed to the attending EP that ordered or supervised the ordering. Risk adjustment for all CT imaging and pre-specified clinical indications (abdominal trauma and non-trauma, chest trauma and non-trauma, cervical trauma, headache, and head trauma) was done through hierarchical, mixed-effects logistic regression adjusting for patient, EP, and hospital-level effects. Patient factors were adjusted for using propensity scores generated using random forest methods including numerous clinical variables. We report adjusted and non-adjusted CT utilization rates for each EP by quartiles and weighted kappas based on CT type.

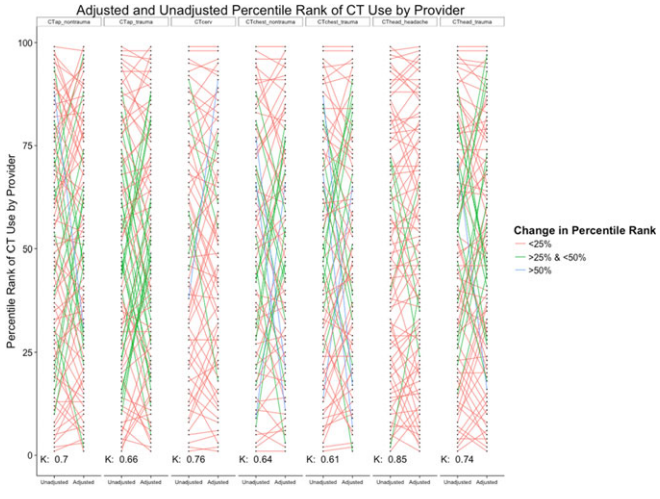

Figure 93 – Venkatesh

Results: We included 136,938 ED visits evaluated by 88 EPs. The overall CT imaging rate was 25% with broad unadjusted provider-level variation (median: 25%, 5th/95th percentile: 16%-36%). Unadjusted and risk-adjusted provider imaging rates among different CT types were most similar for CT imaging in headache (kappa = 0.85, p=<.05) and least similar for chest trauma (Kappa = 0.61, p=<.05). The use of risk adjustment resulted in 30% (n=26) of EPs being classified in a different performance quartile for overall imaging and 32-54% (n= 28-48) being classified in a different performance quartile for condition-specific CT imaging rates. Figure Venkatesh 1 demonstrates the condition-specific kappa and the effect of risk adjustment on provider-level imaging rates by condition.

Conclusion: Risk-adjustment substantially impacts provider-level profiling of EP CT utilization within a health system, particularly for chest CT utilization metrics. Future quality measures of EP imaging use should include risk-adjustment to appropriately profile differences in patient case-mix between EPs.

94 Condition Specific Variation in Emergency Physician CT Utilization: Implication for Quality Improvement

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Background: There is wide variation in CT utilization between emergency physicians (EPs) leading to increased exposure to ionizing radiation and costs, however little is known about the degree to which variation is condition specific.

Objectives: To examine EP variation in condition-specific CT utilization using machine learning algorithms.

Methods: Cross-sectional analysis of all ED visits at 4 EDs in a health system between 10/2013 and 10/2014 using structured queries from an electronic health record (EHR) data warehouse we included all adult ED visits while excluding patients who left the ED before completing treatment, departed against medical advice or died in the ED. CTs were attributed to the attending EP that ordered or supervised the ordering of each CT. Hierarchical, mixed-effects logistic regression was used to calculate provider-specific CT utilization rates for all CT imaging as well as 7 pre-specified study types (trauma and non-trauma head, chest, and abdomen, and cervical trauma). Each model was adjusted for a patient-level propensity score to account for difference in case-mix and a random provider and random hospital effect to account for the nested clustering of observations This propensity score was generated using random forest methods for each model based on variable importance criteria and plots.

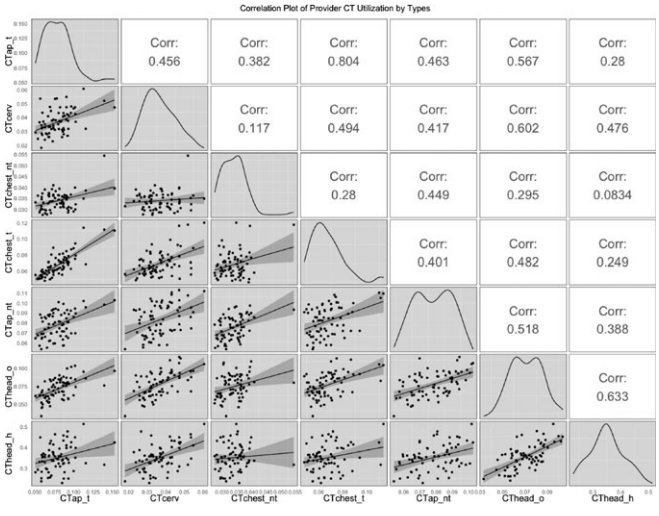

Figure 94 – Taylor

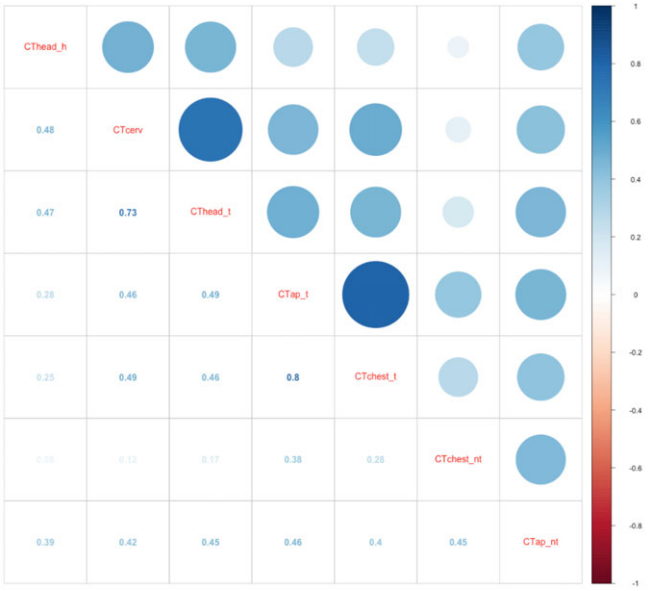

Figure 94 – Taylor

Results: We included a total of 88 EPs that ordered 34,235 CT imaging studies for 136,938 ED visits. The average overall, risk-adjusted CT utilization rate was 26% (IQR: 23% to 28%). The condition with the highest risk-adjusted variation was abdominal, non-trauma imaging (coefficient of variation = 23.1) while non-trauma chest CTs had the lowest risk-adjusted variation (12.3). Within provider correlation was highest between CT chest and abdomen imaging for trauma. Chest CT studies for atraumatic conditions were poorly correlated with all other conditions (Figure 1). Model discrimination was strong with C statistic of 0.84.

Conclusion: There is wide risk-adjusted variation in CT imaging utilization between EPs. Future quality improvement interventions may need to target broad practices across conditions in order to meaningfully improve the efficiency of ED diagnostic utilization.

95 Effect of Epithelial Cell Contamination on Urine Culture Prediction

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Background: Predictive value of urine specimens with contaminating cells from the genital surfaces is often assumed to be limited compared to clean-catch samples. While likelihood ratios for urinalysis (UA) markers to predict culture results have been studied, the effect of epithelial cell contamination on test characteristics has not been determined.

Objectives: We analyzed the effect of squamous epithelial cell (SEC) presence on the accuracy of UA to predict positive urine cultures. We hypothesized that contaminated specimens would have reduced accuracy for prediction of positive cultures in comparison to clean samples.

Methods: In a retrospective, single center cohort study, based in the ED of a large urban medical center, we analyzed data on all urine cultures sent from the ED over a 9 month period with corresponding UA samples. Cultures were classified as positive with growth of >10000 colony forming units of pathogenic bacteria, negative if no growth, or contaminated for all other results. UA specimens were classified as contaminated according to presence >5 SEC per high power field. Sensitivities, specificities, and positive and negative likelihood ratios were calculated for UA markers including leukocyte esterase, bacterial presence on gram stain, nitrite, and WBC presence for positive urine

Sn	LE	Nitrite	WBC	BACT
All	0.93571429	0.37142857	0.87857143	0.83571429
Contaminated	0.93333333	0.33333333	0.86666667	0.88
Clean	0.93846154	0.41538462	0.89230769	0.78461539

Sp	LE	Nitrite	WBC	BACT
All	0.65882353	0.96385542	0.6746988	0.8313253
Contaminated	0.4	1	0.4	0.66666667
Clean	0.70588235	0.95588235	0.73529412	0.86764706

PPV	LE	Nitrite	WBC	BACT
All	0.45804196	0.7761194	0.48809524	0.49159664
Contaminated	0.40935673	0.78125	0.43624161	0.44
Clean	0.53043478	0.77142857	0.5631068	0.57954546

NPV	LE	Nitrite	WBC	BACT
All	0.53043478	0.77142857	0.5631068	0.57954546
Contaminated	0.91935484	0.75124378	0.88095238	0.89156627
Clean	0.96428571	0.80208333	0.94354839	0.89928058

PositiveDLR	LE	Nitrite	WBC	BACT
All	1.944	7.924	2.179	2.210
Contaminated	1.460	7.524	1.630	1.655
Clean	2.815	8.412	3.212	3.435

NegativeDLR	LE	Nitrite	WBC	BACT
All	0.124	0.659	0.203	0.264
Contaminated	0.185	0.698	0.285	0.256
Clean	0.092	0.615	0.149	0.279

Figure 95 – Maher

cultures against all other culture results. Test characteristics were compared between contaminated and clean UA specimens.

Results: 460 complete cases with paired UA and urine cultures were analyzed, consisting of 227 clean UA samples and 233 contaminated samples. Sensitivities ranged from 0.33 to 0.93, and specificities ranged from 0.41 to 1.0 with similar values between groups. Positive likelihood ratios ranged from 1.4 to 8.4, with higher values in the group without SEC contamination for all markers (see Maher Table 1). Negative likelihood ratios ranged from 0.092 to 0.69, with lower values in the group without SEC contamination for 3 of 4 markers.

Conclusion: Analysis of likelihood ratios in contaminated UA specimens showed reduced accuracy in comparison to samples without squamous cells. These results support the reduced reliance on contaminated UA specimens for diagnosing UTI in ED patients.

96 Can Clean-Catch Urine in Infants Really Be Caught...And Clean?

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Background: Standard diagnostic methods for urine sampling are invasive in young children. A new non-invasive bladder stimulation technique has been reported to obtain clean-catch urine in infants aged <30 days (Herreros Fernández et al. Arch Dis Child, 2013;98).

Objectives: 1) Determine proportion and predictive factors for successful clean-catch urine collection using the stimulation maneuvers technique among infants less than 6 months old; 2) Determine the rate of bacterial contamination with this method.

Methods: We performed a prospective cohort study in a tertiary pediatric emergency department in 2015. We included all infants <6 months for which a urine sample was requested. Clean-catch urine sample was collected using bladder stimulation technique by trained research nurses or by an investigator (ML). Urethral catheterization was performed after clean-catch urine in the following situations: 1) positive urinalysis 2) use of antibiotics or 3) unsuccessful clean-catch sampling. Primary outcomes were the proportions of successful clean-catch urine specimens and bacterial contamination. We assessed the association between successful urine sampling and four predictive factors: age, sex, low oral intake and urine void in the last hour. A sample size of 100 children was calculated to have margins of ±10% for the proportion of success.

Results: A total of 137 families were approached and 126 children were included in the final analysis. The study population had a median age of 55 days and included 64 boys. The clean catch procedure was effective in 65 (51%; 95%CI: 43-60%) children with a median (25^{th},75^{th} percentile) time of 45 sec (14, 166). Infants aged 0-29 days; 30-59 days and 60-89 days had statistically more frequent successful procedure, compared to infants >89 days (ORs: 6.35 (1.97-20.46); 3.51 (1.33-9.27) and 4.44 (1.48-13.32) respectively). Sex, low oral intake and urine void in the last hour were not associated with success. Bacterial urine contamination was found in 17% (95%CI: 10-29%) in the clean catch group compared to 3% (95%CI: 0-12%) in the invasive method group.

Conclusion: Bladder stimulation technique is quick and effective in obtaining clean-catch urine in children under 90 days of age. However, it carries a higher risk of bacterial contamination than with invasive methods.

97 The Predictive Value of Fever in Diagnosing Bacteremia in the Pneumococcal and HIB Vaccine Era

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Background: Prior studies reporting association between temperature and bacteremia have been mostly limited to children and when pneumococcal (PC) and HIB vaccinations were uncommon.

Objectives: We determined the association of temperature with bacteremia and mortality in patients presenting to an ED after widespread adoption of PC and HIB vaccinations.

Methods: *Study Design.* Retrospective review of electronic medical records (EMR). *Setting.* Academic tertiary care ED; annual census of 100,000. *Patients.* All patients presenting in the ED in 2014 *Measures. D*emographic and clinical information were extracted from the EMR. Fever was defined as a temperature >38 degrees C. O*utcomes.* Bacteremia, admissions, and in-hospital mortality. *Data Analysis.* Univariate and multivariate analyses were used to determine the association between predictor variables (age, gender, fever, bacteremia) and admission and mortality.

Results: In 2014 there were 100,270 pediatric and adult ED visits. Mean age was 38 ± 24 years, 21% were age <19 years, 52% were female, 3.5% had a fever. Of 10,239 (10.2%) patients who had at least one blood culture, 918 (9%) had bacteremia. Mean of the first recorded temperature was higher for patients with blood cultures than for those without cultures (37.1°C vs 36.9°C, p<.001). Patients with fever were more likely to get a blood culture than those without a fever (34% vs 10%, p<.001). Of those having a blood culture, mean first recorded

Table 1
Singer Table 1

ADMISSION	Odds Ratio	95% CI	P
Age (per year)	1.019	(1.017-1.021)	<.001
Female	0.85	0.78-0.93	<.001
Fever	1.56	1.35-1.81	<.001
+ blood culture	2.72	2.22-3.34	<.001
MORTALITY			
Age (per year)	1.037	1.030-1.043	<.001
Female	0.78	0.62-0.99	.04
Fever	2.29	1.56-3.36	<.001
+ blood culture	2.59	1.96-3.43	<.001

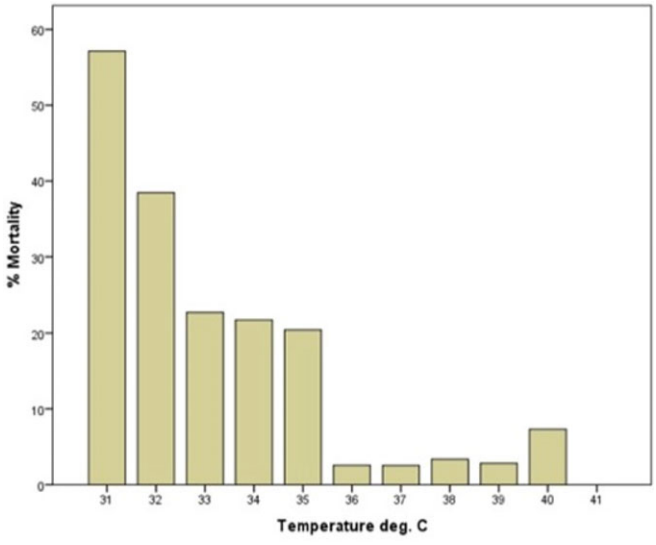

Figure 1. Association of body temperature with mortality

Figure 97 – Boccio

temperature was higher for those with a positive culture than for those without (37.24°C vs 37.07°C, p<.001). Admission rates and in-patient mortality were higher for patients with fever compared to those without fever (31 vs. 22%, P<0.001 and 1.2 vs. 0.5%, P<0.001 respectively). Similarly, admission rates and in-patient mortality were higher in patients with positive vs. negative blood cultures (88 vs. 69%, P<0.001 and 8.0 vs. 2.6%, P<0.001 respectively). Results of multivariate analyses predicting admission and mortality are shown in the Table *(see Singer Table 1)*. Mortality increased as temperatures became higher or lower than normal *(See Singer Figure 1)*

Conclusion: In the era of widespread availability of pneumococcal and HIB vaccinations, fever and bacteremia, as well as age and female gender, are significantly associated with hospital admission and mortality both in children and in adults presenting to the ED.

98 Risk of Bacterial Co-Infections in Febrile Infants ≤ 60 Days Old with Documented Viral Infections

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Background: Febrile infants ≤ 60 days old with documented viral infections are likely at lower risk for serious bacterial infections (SBIs; urinary tract infections (UTI), bacteremia, and meningitis) than those without viral infections.

Objectives: To determine the risk of SBIs in febrile infants ≤ 60 days old with and without documented viral infections.

Methods: We enrolled febrile infants ≤ 60 days old evaluated for SBIs and viral infections in an emergency research network. We compared patient demographics, presenting temperatures, physical exam findings, white blood cell (WBC) and absolute neutrophil counts (ANC), and rate of SBIs between viral-positive and viral-negative infants. We performed a separate analysis stratified by age ≤ or > 28 days. We performed a multivariable logistic regression analysis to assess the association of viral infections with SBIs, adjusting for patient demographics, clinical characteristics, and blood testing results.

Table 1: Mahajan

Variable	Viral-positive	Viral-negative	RR
Any **SBI**	45/1222 (3.7%) (2.7-4.9%)	223/1785 (12.5%) (11.0-14.1%)	3.4 (2.5-4.6)
UTI	33/1200 (2.8%) (1.9-3.8%)	187/1748 (10.7%) (9.3-12.2%)	3.9 (2.7-5.6)
Bacteremia	10/1221 (0.8%) (0.4-1.5%)	50/1783 (2.8%) (2.1-3.7%)	3.4 (1.7-6.7)
Meningitis	5/1222 (0.4%) (0.1-1.0%)	14/1783 (0.8%) (0.4-1.3%)	1.9 (0.7-5.3)
Bacteremia or meningitis	13/1221 (1.1%) (0.6-1.8%)	57/1783 (3.2%) (2.4-4.1%)	3.0 (1.7-5.5)

Results: 3007/4778 (62.9%) enrolled infants had any viral testing performed. 1222 (40.6%) were viral-positive. The overall rate of SBI was 8.9% (268/3007). The rate of SBIs in viral-positive infants was 3.7% (45/1222; 95%CI 2.7%-4.9%) and 12.5% (223/1785; 95%CI 11.0%-14.1%) in viral-negative infants (risk difference:8.8%; 95%CI 7.0-10.7%). The rate of bacterial meningitis was lower but, statistically not significant, in viral-positive than viral-negative infants (Table 1). The risk of SBI among viral-positive infants stratified by age was similar to the primary analysis. The 3 variables that were associated with SBI in the multivariable analyses were: a negative viral status (adjusted odds ratio [AOR] 3.1, 95%CI 2.2 - 4.4), temperature (AOR 1.8 for every 1°C increase, 95% CI1.4-2.4), and ANC (AOR 1.3 for every 1000 cells/mm3 increase, 95%CI 1.2-1.4).

Conclusion: Febrile infants ≤ 60 days old with documented viral infections are at lower, but non-negligible, risk for SBIs compared to febrile infants without viral infections. Although UTIs were the most common SBIs in viral-positive patients, there was a non-negligible risk of bacteremia and bacterial meningitis as well.

99 Cost Effectiveness of Emergency Department-Initiated Treatment for Opioid Dependence

Susan H. Busch[1], Kathryn F. Hawk[2], David A. Fiellin[2], Patrick G. O'Connor[2], Marek C. Chawarski[2], Patricia H. Owens[2], Michael V. Pantalon[2], Steven L. Bernstein[2], and Gail D'Onofrio[2]
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Background: Patients with opioid dependence receiving ED-initiated buprenorphine (Bup) and ongoing treatment in primary care (BupPC) were twice as likely to be engaged in addiction treatment at 30 days and significantly less likely to use illicit opioids compared with referral to community-based treatment (RT) or Screening, Brief Intervention and Referral (SBIRT) [JAMA 2015;313:1636-44]

Objectives: To evaluate the cost effectiveness, at 30 days, of 3 methods of intervening on opioid dependence in the ED.

Methods: 329 opioid-dependent patients 18 years or older, were randomized in an urban ED clinical trial from 4/7/09 to 6/25/13 comparing BupPC (n=114), consisting of Bup initiated in the ED with 10 week follow up in primary care, to RT (n=104) and SBIRT (n=111). Cost analyses was limited to the 244 (74%) patients with 30-day assessment data. Intervention Implementation, healthcare use, patient time, and crimes committed were converted to dollar values. Outcomes included 30-day treatment engagement and self-reported past 7-day opioid use. Using bootstrapping methods, we constructed cost effectiveness acceptability curves (CEACs) that indicate the probability each of the

Table 1
Busch: Average Costs and Outcomes

	BupPC (N=93)	RT (N=69)	SBIRT (N=82)
Health care costs			
Total health care costs	1871 (2927)	2011 (3125)	1872 (3465)
Societal costs			
Crime cost (SD)	$2566 (12357)	$5357 (17919)	$3743 (17869)
Patient time cost (SD)	$144 (314)	$459 (992)	$524 (955)
Outcomes			
Enrolled and receiving formal addiction treatment at 30 days (%)	86	39	45
Change in days of self-reported illicit opioid use in the past 7 days (mean days)	4.43	3.01	3.23

three treatments is cost effective under different assumptions about the threshold value of outcomes studied.

Results: Considering only health system costs, CEACs indicate that at all positive threshold values, the BupPC treatment arm is more likely to be cost-effective than SBIRT or RT. For example, at an $1100 threshold (equivalent to the marginal benefit of reduced crime in the BupPC treatment) we are 77% certain that BupPC is the most cost effective option for treatment engagement (Figure 1). Similar results were found for both outcomes studied.

Conclusion: The BupPC group was most likely to be cost effective across a range of threshold values. This suggests policymakers and other stakeholders should consider developing incentives to encourage the use of BupPC in ED treatment.

100 Predictors of Emergency Department Discharge with an Opioid Prescription: Prescribing Opioids Safely in the Emergency Department (POSED) Study

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Background: Prior studies evaluating the association of demographics and ED opioid analgesic prescribing relied on prescription databases or survey data. The POSED consortium collected patient and prescription characteristics for all ED visits from 19 geographically diverse community and academic EDs over 1 week in October 2012 (Ann Emerg Med 2015;65:493-9).

		Number	Odds Ratio	p-value	95% CI
Race/ Ethnicity	White	5,488	reference group		
	Asian	471	0.71	0.02	0.53-0.95
	Black	3,838	0.87	0.03	0.7-0.98
	Hispanic	1,625	0.91	0,24	0.77-1.07
Age Categories	18-34	4,661	reference group		
	35-49	3,151	1.13	0.04	1.01-1.29
	50-64	2,336	1.08	0.23	0.94-1.24
	65-90	1,272	0.58	<0.01	0.48-0.71

Table 100: Hawk.

Objectives: To evaluate the relationship of race/ethnicity, age, and gender on the likelihood of receiving an opioid prescription on ED discharge.

Methods: The POSED database was reviewed using descriptive statistics for disposition, race/ethnicity, age, site and gender. Patients discharged from EDs that reported any data about race or ethnicity were included in analysis. Univariate and multi-variable logistic regression models were used to identify factors associated with receiving an opioid prescription at ED discharge.

Results: There were 13,092 ED discharges from 13 sites that collected data about race or ethnicity. From the univariate logistic regression, race/ethnicity was significantly associated with receiving an opioid prescription. Odds ratios (OR) compared to white race were: Asian (OR=0.65, 95%CI 0.49-0.87), Black (0.75, 95%CI=0.67-0.84) and Hispanic (OR=0.98, p=0.8, 05%CI 0.75-1.0). Age was also significantly associated, with OR compared to age 18-34 as follows: ages 35-49 (OR=1.14, 95%CI=1.01-1.29) and ages 65-90 (OR=0.64, 95%CI=0.55-0.74). Prescribing variation was noted across sites (p=<0.01), but did not vary by gender. The multivariate model containing race, age categories, site, and gender (table) demonstrated opioid prescribing on ED discharge is less likely for Asian (OR= 0.71, p=0.02) and black (OR= 0.87, p=0.03) patients in comparison to whites. This model also demonstrated increased opioid prescribing to those aged 34-49 (OR=1.13, p=0.04) and decreased prescribing to those aged 65 - 90 (OR=0.58, p<0.01) in comparison to 18-34 year olds.

Conclusion: Patients that are Asian, Black or aged 65-90 were less likely to be discharged from the ED with an opioid prescription, and patients aged 35-49 were most likely to be discharged with a prescription for opioids. The etiology of these differences is likely multi-factorial.

101 Prescription Opioid and Benzodiazepine Overdose: Are Prescribers Being Informed?

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Background: Every day 44 people in the US die as a result of prescription drug overdose (OD). Many of these patients are seen in an emergency department before they die. For example in 2013, of the 853 OD deaths in Maryland, 59% had presented to an ED with an OD within the past year. Prescribing physicians may be unaware of these events and continue providing opiate and benzodiazepine prescriptions to high risk patients.

Objectives: To characterize emergency physician (EP) and advanced practice provider (APP) use of Prescription Drug Monitoring Programs (PDMPs) to identify previous prescribers of OD patients and assess their willingness to contact the identified prescribers.

Methods: We asked EPs and ED APPs in the Carolinas Healthcare System to complete an online electronic survey. We collected anonymous responses from these providers on the frequency with which they encounter OD patients, usage patterns of the PDMP, methods of identifying previous prescribers, patterns and methods of contacting prescribers, and barriers to this practice.

Results: We targeted 180 providers and achieved a 59% response rate. 17% of EPs reported that they "never" review the PDMP when a patient presents with an OD and 16% reported that they "always" review the PDMP. 32% of respondents reported that they have not previously identified prescribers for an OD patient, while 96% reported either that they already do or would consider use of the PDMP for this purpose in the future. 31% reported having contacted previous prescribers, 60% by phone, 14% by email, and 35% by integrated EMR messaging. 66% reported that they would contact a prescriber against the wishes of the patient. When asked what barriers existed to communication with prescribers, 88% reported time/workflow, 71% reported that they had no means, 33% reported HIPAA or legal concerns, and 13% reported privacy concerns.

Conclusion: Less than one third of ED providers surveyed have contacted previous prescribers of patients who presented with an OD. This survey outlines areas for improvement in secondary prevention through increased communication between ED providers and controlled substances prescribers.

102 The Effect of Physician Workload on Prescription of Opioids at Discharge in Five Emergency Departments

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Background: There has been a dramatic increase in the number of opioid prescriptions filled in U.S. pharmacies and prescribed in emergency departments (ED) over the past decade. No studies have examined the influence of physician workload, defined as the number of patients an attending physician is responsible for, on the prescription of opioids at patient discharge.

Objectives: We sought to examine the association between physician workload and opioid prescription at ED discharge.

Methods: Using a secondary dataset from Emergency Medicine Business Intelligence (EMBI), we conducted a retrospective cohort study of ED visits from 5 geographically disparate U.S. hospitals. Multivariable logistic regression with random effects for the physician examined physician workload on the prescription of an opioid at patient discharge adjusting for overall ED census, patient age, sex, triage acuity, facility, insurance, chief complaint, and time of day of the initial ED presentation. We hypothesized that increased physician workload would be associated with a decreased likelihood of opioid prescription at ED discharge.

Results: We included 34,938 ED visits across 5 EDs. Among these visits, 62% were female, with a median age 40 (IQR 28, 55) years old, and 86% had some form of insurance. In the adjusted analysis, for each additional patient in a physician's workload, there was a small, but significant reduction in the odds of prescription of an opioid at discharge (OR 0.99; 95% CI 0.98, 0.99). In other words, for every 5 additional patients each attending physician was responsible for, they were 5.7% less likely to prescribe opioids. ED census at the time of patient discharge was not associated with opioid prescription rates. Factors associated with lower odds of opioid prescription at discharge included triage acuity (OR 0.94; 95% CI 0.90, 0.98), and compared with the reference of Medicaid, Medicare insurance status (OR 0.72; 95% CI 0.66, 0.78).

Conclusion: Increased physician workload is independently associated with a reduction in the likelihood of prescribing opioids to patients when they are discharged from the ED. Understanding factors that influence prescriptions for opioids are needed to address increases in ED opioid prescribing.

103 To Intubate or Not to Intubate: Emergency Medicine Physicians' Perspective on Intubating Critically Ill, Terminal Cancer Patients

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Background: The emergency department (ED) is a frequent destination of terminally and critically ill patients. Emergency physicians (EPs) often need to decide whether or not to intubate such a patient. Patients are frequently intubated even when physicians believe it is not beneficial.

Objectives: To explore EPs attitudes about intubating or not intubating a critically and terminally ill patient and the reasons why.

Methods: Fifty EPs at three emergency departments (one university-based, one community, and one HMO) in Southern California completed an anonymous survey. The survey presented a hypothetical case of a terminal cancer patient who is in pending respiratory failure. Fourteen questions along a 5-point Likert scale asked EPs about prognosis, the benefit of intubation and what factors and situations would lead them to intubate or not intubate the patient.

Results: 100% (50/50) of physicians completed the survey. 96% felt the patient would likely die during hospitalization, and 94% believed intubation would be non-beneficial. If the family insisted, 26% would still intubate the patient. 94% would not intubate the patient if palliative care were available in the ED. 52% felt they received inadequate training in palliative care, yet 96% felt comfortable in discussing goals of care and 76% in interpreting advance directives. 68% believed that a discussion about goals of care was more time consuming than intubating the patient. There was a strong consensus that EPs should determine the code status in the ED through multiple ways (66 to 94%). No significant difference existed between the 3 sites in the survey questions.

Conclusion: EPs vary in their attitudes about intubating a dying patient when family demanded it, even when they felt it was non-beneficial. This attitude could potentially be mitigated by educational efforts directed at EPs or the availability of palliative consultation in the ED, as most EPs felt inadequately trained in palliative care, even while they felt a responsibility to determine code status.

104 A Randomized Controlled Trial on Oral Analgesic Utilization for Children Presenting with a Musculoskeletal Trauma in the Emergency Department

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Background: A single-agent approach to children's moderate to severe pain is often inadequate. To date, no studies have evaluated the combined use of oral morphine and ibuprofen for optimal pain management of children presenting to an Emergency Department (ED) for musculoskeletal (MSK) trauma.

Objectives: To assess the efficacy of a combination of oral morphine and ibuprofen for pain management in children with MSK trauma in the ED.

Methods: A double-blind, placebo-controlled, multi-centered, three-arm, randomized clinical trial of 500 patients was conducted at three pediatric tertiary care EDs. Patients were randomized (in a 2:1:1 ratio)

to receive (orally): (a) morphine (0.2mg/kg) + ibuprofen (10mg/kg) (Group MOR + IBU) or (b) morphine (0.2 mg/kg) + placebo (Group MOR) or (c) ibuprofen (10mg/kg) + placebo (Group IBU). Patients 6 to 17 years of age, who presented to the ED with a MSK trauma, and a score >30 mm on the 100mm Visual Analogue Scale were eligible to participate. Primary outcome was pain intensity score under 30 mm (mild pain) at 60-minutes (T-60) after treatment administration.

Results: A total of 456 patients were included in analyses: 177 (MOR + IBU), 188 (MOR), 91 (IBU). Mean age was 11.9 ± 2.7 years, with a majority of boys (55.3%) and Soft tissue injuries (62%). There were no differences in baseline characteristics in the three groups. Baseline mean pain score was 60.9 ± 16.2 mm. Only 30% (MOR + IBU), 29% (MOR) and 30% (IBU) of patients reached a pain score under 30 mm at T-60 (p=0.83). Mean pain scores at T-60 were 42.3 ± 23.2 mm (MOR + IBU), 43.8 ± 23.1 mm (MOR) and 42.3 ± 23.3 mm (IBU) (p=0.83). No severe adverse events were observed in any of the groups, at any of the study measurement points.

Conclusion: Combination of morphine with ibuprofen did not provide any additional pain relief for children with MSK injuries, in the ED. None of the study medication provided optimal pain management, as the majority of children did not reach the WHO definition of mild pain. Alternative analgesic combinations should be investigated to optimize pain relief of children who present to the ED with MSK injuries.

105 Trends in CT Utilization for Emergency Department Patients with Abdominal Pain

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Background: Abdominal pain is a common emergency department (ED) complaint. In the past, an increased use of CT scans has been demonstrated. It is unknown if that increase has continued in more recent years and in which patients are most likely to receive a CT scan. There has been controversy and concern regarding increasing use of CT scans due to increased radiation exposure, length of stay and cost.

Objectives: The objective of this study was to explore trends in CT utilization in recent years among ED patients who present with abdominal pain and identify predictors of CT utilization.

Methods: A retrospective review of data from the National Hospital Ambulatory Medical Care Survey, 2007-2011 was performed. All encounters with a reason for visit related to abdominal or pelvic pain were included in analysis exclusive of pregnancy or trauma- related complaints. We studied CT utilization over time and developed a logistic regression model, examining predictors of CT scan utilization based on patient and hospital characteristics, including age, sex, payment type, geographic region, hospital type, disposition, and reported severity of pain.

Results: There were an estimated 18.7 million visits for abdominal pain in 2007 and 23.0 million in 2011. Overall, CT utilization increased 9.1% from 25.3% to 27.6% of visits, p=0.01. Patient characteristics associated with CT utilization for abdominal pain included age >24 years, white race, patient report of severe pain (>=8), private insurance and hospital admission. Female patients were less likely to receive a CT scan. Urban EDs, ED location in the Northeast US, and teaching institutions were also associated with increased likelihood of CT scan use. There were no differences in CTs use based on hospital funding type.

Conclusion: There was an overall increase in CT utilization in EDs for abdominal pain especially in older patients, those in severe pain, and patients who are admitted. Non-white, female and those with Medicaid were less likely to receive a CT scan. Variations in care that are independent from clinical presentation suggest uncertainty in how to use this powerful but controversial diagnostic test. Decreased utilization in females suggest an increased awareness of radiation exposure. Future studies will attempt to discern the appropriateness of CT scanning in the identified subgroups.

Category		AOR of CT Scan	p-value
Age	18-24	Ref	
	25-34	1.42	0.001
	35-44	1.76	0.001
	45-54	2.1	0.001
	55-64	2.24	0.001
	65+	2.19	0.001
Race	Non-white	Ref	
	White	1.41	0.001
Sex	Male	Ref	
	Female	0.85	0.001
Payer	Self-pay	Ref	
	Medicare	0.91	0.087
	Medicaid	0.76	0.001
	Private	1.22	0.001
Region of US	Northeast	Ref	
	Midwest	0.9	0.109
	South	0.86	0.027
	West	0.079	0.003
Teaching	Non-teachi	Ref	
	Teaching	0.86	0.047
Metro	Rural	Ref	
	Urban	1.67	0.001
Disposition	Discharged	Ref	
	Observatio	1.41	0.001
	Admitted	1.89	0.001
	Admitted t	0.79	0.076
Severe pain (>8)	Yes	Ref	
	No	1.83	0.001

Table 105: Meltzer.

106 Acute Kidney Injury Following Contrast Enhanced CT in the ED: A Controlled Retrospective Analysis

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Background: Of the more than 30 million contrast-enhanced CT (CECT) scans performed in the US annually, one quarter are ordered in the ED. Intravenous contrast administration is cited as a leading cause of acute kidney injury (AKI) and is associated with adverse clinical outcomes. However, most studies of AKI following CECT have been poorly controlled, leading many to question the causal relationship between contrast administration and AKI.

Objectives: In this study, we utilized two separate control groups to determine whether contrast administration in the ED independently increases risk for developing AKI.

Methods: A retrospective cohort design was used to compare incidence of AKI (as defined in Table 1) in patients who underwent

Effect of Contrast on Likelihood of AKI†	
	Odds Ratio (95% CI)
IV Contrast Administration	0.96 (0.86-1.07)
Computed Tomography	0.98 (0.87-1.12)
Female	1.44 (1.32-1.58)***
Age	1.02 (1.02-1.02)***
Race	
Black or African American	Reference
White	1.17 (1.06-1.29)**
Other	1.34 (1.12-1.60)**
Critical Care Designation	0.94 (0.80-1.12)
eGFR	1.02 (1.02-1.03)***
Intravenous Fluid Administration	0.63 (0.56-0.71)***
Nephrotoxic Medication Administration	1.55 (1.37-1.75)***
Comorbidities	
Diabetes Mellitus	1.24 (1.11-1.39)***
Congestive Heart Failure	2.08 (1.84-2.35)***
Hypotension	0.86 (0.66-1.12)
HIV/AIDS	1.14 (0.91-1.42)
Anemia	1.05 (0.95-1.15)
Hypoalbuminemia	1.35 (1.21-1.52)***
Chronic Kidney Disease	1.99 (1.69-2.33)***
Renal Transplant	1.16 (0.70-1.92)
Hypertension	1.16 (1.04-1.29)**
†AKI defined as an absolute rise in SCr level greater than 0.5 mg/dL or at least a 25% increase over baseline SCr level in the 48 to 72 hours after a CT scan; *** Significant at the 0.1% level, ** Significant at the 1% level, * Significant at the 5% level	

Table 106: Hinson.

CECT, unenhanced CT or no CT over a 5-year period in the ED of a large academic medical center. Inclusion criteria included baseline serum creatinine (sCr) between 0.4 and 4.0 mg/dL with repeat sCr measurements available at 48-72 hours. All patients with a history of dialysis or an ED visit with CT performed in the past 6 months were excluded. A multivariate logistic regression model was used to identify independent risk factors for AKI. Odds ratios for AKI were calculated separately for subgroups stratified by baseline sCr and eGFR, with and without propensity score analysis. Potentially nephroprotective practice patterns of clinicians were also analyzed.

Results: A total of 20,837 patients were included (8,378 with CECT, 6,560 with unenhanced CT and 5,899 without CT). Incidence of AKI was similar for all groups and logistic regression modeling showed that patients who received IV contrast were no more likely to develop AKI than those who did not receive contrast (Table 1). Subgroup analysis with and without propensity matching showed no increased risk of AKI following contrast administration regardless of baseline renal function. The decision to administer contrast was negatively correlated with baseline creatinine (Spearman's rho = 0.21, $p < 0.001$) and IV fluid administration was prescribed much more frequently in patients undergoing CT with contrast than without (24.1% versus 14.3%, $p < 0.001$).

Conclusion: In a clinical setting where IV contrast is administered judiciously and is accompanied by nephroprotective treatment with IV fluids, contrast administration does not increase risk of AKI.

107 CT Risk Disclosure: A Practice in Evolution

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Background: Due to increased attention to potential malignancy risks associated with CT, experts are increasingly advocating for risk disclosure for patients undergoing CT.

Objectives: To evaluate emergency physician practices and attitudes regarding CT radiation risk disclosure and consent.

Methods: We conducted a cross-sectional study of U.S. and Canadian emergency medicine residency directors and associate/assistant directors using a 14-question web-based survey that we pre-tested, pilot tested, and administered using a modified Dillman technique. Our primary outcome was the proportion who "almost always/most of the time" discussed potential CT malignancy risks.

Results: Of 545 eligible participants, 276 (50.6%) responded (91% from the U.S.). Respondents were geographically similar to non-respondents, however, had less practice experience (59.1% vs 49.1% in practice ≤10 yrs, p=0.02). Of note, 82.1% (95%CI: 76.8%, 86.6%) reported "almost always/most of the time" discussing potential malignancy risks for patients ≤18 yrs; proportions for patients 19-40 yrs, 41-65 yrs, and >65 yrs were 50.6% (95%CI: 44.4%, 56.7%), 20.7% (95%CI:16.0%, 26.0%), and 5.2% (95%CI: 2.9%, 8.5%), respectively. Furthermore, 57.1% of respondents reported being "extremely/very comfortable" discussing potential risks with patients/families. Factors deemed to be of "high/very high importance" for risk disclosure were patient/family request for CT not felt to be indicated by the physician (86.5%) and patient/family-initiated queries of CT risks (75.6%). The factor deemed to be of "high/very high importance" in not discussing CT risks was that the patient was elderly or had a reduced life expectancy (57.4%). If risk disclosure was mandatory, 85.9% favored verbal over written consent. Among those in practice ≤10 yrs who favored verbal consent, 67.5% did not support associated medical record documentation, while only true for 32.5% for those in practice >10yrs (p=0.03).

Conclusion: Emergency physicians frequently disclose potential malignancy risks from CT for young adult and pediatric patients, however, only about half are comfortable discussing risks. Patient request for a CT not deemed indicated was an important factor in risk disclosure for most physicians. Opportunities exist to optimize and standardize ED risk disclosure practices.

108 Overutilization of Computed Tomography Angiography for Acute Aortic Dissection: Identifying Additional Need for a Reliable Screening Biomarker.

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Background: Computed tomography angiography (CTA) is currently the primary modality for diagnosing the rare, yet life threatening acute aortic dissection (AAD) in the emergency department (ED). Multiple small-scale studies have identified the d-dimer laboratory test as a potential screening tool to exclude AAD.

Objectives: We sought to quantify the frequency of positive CTAs for AAD when used in conjunction with a d-dimer.

Methods: This was a retrospective cohort study of all patient encounters from November 2013 through February 2015 across an 8 emergency department (ED) hospital system with a combined annual census of 375,000. Using the electronic medical record database, all patients who had a d-dimer and CTA for AAD performed within 6 hours of ED arrival were identified. The standard cutoff of 500 ng/ml was considered a positive d-dimer result. Sensitivity, specificity, negative likelihood ratio (NLR) and negative predictive value (NPV) of a positive d-dimer in AAD were determined.

Results: A total of 220 CTAs with a d-dimer result were identified. Average patient age was 56 years and 57% were female. A positive d-dimer was present in 132 (60.0%) cases. Two (0.9%) AADs were detected; 1 Stanford type A and 1 Stanford type B, both with a positive

d-dimer of 770 and 750 ng/ml, respectively. In AAD, a positive d-dimer had a sensitivity of 100% (95% CI 15.8-100%), specificity of 40.4% (95% CI 33.8-47.2%), NLR of 0 and NPV of 100% (95% CI 95.9-100%).

Conclusion: In this study, the yield for diagnosing AAD using CTA in conjunction with a d-dimer was low. A negative d-dimer may eliminate the need for CTA in up to 40% of suspected cases of AAD. Future, large-scale studies should focus on the role of a negative d-dimer in AAD.

109 Variation in Advanced Imaging for Pediatric Patients with Abdominal Pain

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Background: Abdominal pain is a common reason for pediatric patients to present to the emergency department (ED). Computed tomography (CT) and ultrasonography (US) can assist with diagnosis. CT has come under scrutiny given concerns regarding radiation.

Objectives: To evaluate variation in imaging for pediatric patients with abdominal pain discharged from the ED and assess non-clinical patient and ED-level factors associated with CT use.

Methods: We performed a retrospective cohort analysis of visits to 16 EDs (15 general and 1 pediatric) within an integrated, regional health network from 2007-2013. We included patients ≤ 18 years of age presenting with abdominal pain and discharged home. The primary outcome was imaging (CT or US). The secondary outcome was CT, specifically. We performed hierarchical modeling and multivariate logistic regression to determine factors independently associated with imaging. Both models' results were similar; therefore, we report the logistic model.

Results: There were 21,152 visits by 17,540 patients. The median age was 12.3 years (IQR 9.7). Most patients were female (61.3%), white (71.3%), and privately insured (58.5%). Academic EDs accounted for 51.8% of visits. The pediatric ED accounted for 41.2% of visits. Of general EDs, 53.1% were low pediatric volume. For all visits, 30% included imaging and 15.3% included CT. White patients had higher odds of imaging [OR 2.5 (95%CI:2.0-2.5)] and of CT [OR 2.5 (95%CI:2.0-3.3)]. Privately insured patients had higher odds of imaging [(OR 2.0 (95%CI:1.4-2.0)] and of CT [OR 1.7 (95%CI:1.4-2.0)]. Visits to academic hospitals had lower odds of imaging [OR 0.7 (95%CI:0.6-0.8)] and of CT [OR 0.7 (95%CI:0.6-0.9)]. Overall, visits to general EDs had lower odds of imaging [OR 0.6 (95%CI:0.5-0.7)]; however, odds of receiving a CT were 6.7 times higher (95%CI:5.6-8.0) than at the pediatric ED. Comparing low and high pediatric volume general EDs, odds of imaging or CT alone were similar.

Conclusion: There are disparities in imaging use between racial and insured groups of children. General EDs are less likely to use imaging, however, when utilized, CT appears to be the modality of choice. Our results suggest an opportunity for optimization of imaging practices for children with abdominal pain.

110 Portable Chest X-ray Utilization in the Emergency Department

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Background: Portable chest x-ray (PCXR) image quality is limited when compared to a posterior-anterior/lateral chest x-ray (PA/LAT CXR) taken in the radiology suite. There is concern that overuse of PCXR may diminish quality of patient care, is more labor intensive, and may also increase risk of radiation exposure to health care workers in the ED.

Table 1

	Number	Percent	Avg. Age	# admitted	% Admit
Total CXR	2297	100 %	59.6		
PCXR	816	35.5%		668	81.9%
PA/LAT CXR	1481	64.5%		613	41.4%

Criteria for "Appropriate" Use	% of sample
Clinical Instability	80.5%
Line/Tube Placement	8.8%
Immobilization	1.6%
Device Requirement/Ventilator	0.8%
Ambulation/Cooperation issues	28.5%

Table 110: Bonner.

Objectives: We performed a retrospective analysis of chest x-ray utilization in the emergency department to quantify: a) The percentage of all chest x-rays ordered that were PCXRs and b): the indications for ordering a PCXR. This analysis was performed to evaluate whether over utilization of the PCXR, results in missed opportunities for a higher quality and possibly more cost effective PA/LAT CXR.

Methods: We evaluated all chest x-rays ordered in the ED for the 3 month study period. We then compared the frequency of PCXR to PA/LAT CXR and conducted a chart review to see if the portable study met an "appropriate" indication for a portable exam and to determine the patient outcome. We defined the clinical standard for an appropriate PCXR study as: a) clinical instability of the patient, b) line/tube placement verification, c) patient immobilization, d) need for a life support device, e) inability or refusal to ambulate/cooperative.

Results: In the 3 month period of the study, 2297 chest x-rays were ordered. 816 (35.6%) were portable. 1481 (64.4%) were PA/LAT CXR. 668 of the 816(81.9%) PCXR patients were admitted. Only 613 of the 1481 (41.4%) PA/LAT CXR patients were admitted. 94.4% of PCXR ordered, had at least 1 criteria for "appropriate" use, only 5.6% of PCXR ordered did not meet "appropriate" use criteria.

Conclusion: PCXR utilization in the ED is frequent, but the utilization appears to be appropriate. Only a small amount of PCXR did not meet our pre-established indication criteria. PCXR patients were more likely to be admitted than non-PCXR patients (81.9% vs. 41.4%, $p<0.001$)

111 Effect of Incorporating a Risk Stratification Decision Support Tool into the Electronic Medical Record on the Utilization and Accuracy of CT Angiogram in Diagnosis of Pulmonary Embolism in the Emergency Department

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Background: Emergency physicians frequently order CT pulmonary angiograms (CTA) for suspected pulmonary embolism (PE) but diagnostic yield is low. To reduce the number of CTAs performed and increase diagnostic yield we created a decision support tool to risk stratify suspected PE prior to ordering CTA. This tool used revised Geneva criteria to risk stratify, then direct provider to use the PERC calculator and/or send d-dimer as appropriate. The tool was inserted in the electronic medical record (EMR) at multiple EDs in a single health care system.

Objectives: To determine the impact of a decision support tool on provider evaluation of possible PE as quantified by the number of CTAs performed and the diagnostic yield. We hypothesized that post-implementation the number of CTAs performed would decrease and the diagnostic yield would increase.

Methods: This retrospective study compared CTA utilization and diagnostic yield pre and post implementation of the decision support tool in six diverse EDs. Visits were compared between the first nine months of 2014 and post implementation, the first nine months of 2015. There were 311,313 ED visits in 2014 and 307,200 visits in 2015 during each study period. Data were extracted using the reporting tools in the Cerner EMR. Statistical analysis using Chi-square compared proportions of CTA performed as a percentage of total ED visits; the percent positive CTA for all CTA for PE, and the percent positive CTA for use with and without the risk stratification tool (there was a work around to avoid using the tool).

Results: Total CTA utilization proportionally decreased post implementation with 4981 CTAs of 311,313 (1.5%)visits in 2014 compared to 4608 CTA of 307,200 (1.6%) visits, p =0.001. The proportion of patients with a positive study of all those who had CTA was not significantly different from 2014 to 2015 (5.7% vs 6.6%, p=0.68). In the post-implementation group, the percent positive CTAs was higher when the EMR tool was used (263 positive of 3926) compared to when it wasn't used (39 positive of 682), although this did not reach statistical significance (6.7% vs 5.7%, p=0.34).

Conclusion: Implementation of a PE decision support tool in the EMR across multiple EDs was associated with reduced CTA utilization. Diagnostic accuracy of CTA for suspected PE did not significantly improve with the decision support tool.

112 CT Utilization Among Repeat Visit Patients with Head Injury in the ED

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Background: CT scans are associated with radiation exposure and there is much variability in ED physician decision-making about their use in mild traumatic brain injury (mTBI). A second ED visit for any chief complaint raises concern about missed diagnoses, but is particularly concerning in head trauma.

Objectives: The objective of this study was to evaluate the use of CT in repeat-visit ED patients with symptoms of mTBI by assessing the frequency of CT use and abnormal findings on both initial and repeat ED visits for head injury.

Methods: This is a retrospective study of all ED patient encounters using electronic health records over a 6 year period (9/2008-4/2015) at a tertiary level 1 trauma center and pediatric trauma center with 85,000 visits annually. Diagnosis of mTBI was determined using International Classification of Diseases, 9th revision diagnosis codes related to head injury. A repeat visit was defined as a return to the ED within 7 days of initial care for mTBI symptoms. Admission with a diagnosis of a serious traumatic head injury was used as a surrogate for positive CT in patients who received a scan.

Results: There were 11,094 ED visits with head injury, and 9,998 patients were discharged home after their initial visit. The mean patient age was 33 years old, and 54% of patients were male. The percentage of patients receiving a head CT on their first visit was 47.6% and head CTs with significant findings or admission were present in 9.1% of the population. There were 138 return visits (1.3%) and 45.7% received a repeat head CT, of which only one CT scan demonstrated new findings (Subdural) resulting in admission.

Conclusion: Head CT is a common diagnostic modality in the ED work up of head trauma and related complaints. The vast majority of head CTs are negative. When returning for a repeat visit related to head injury, patients receive repeat CT scans at a high rate. These CTs are even less likely to yield positive findings. Patients who present to the ED for second evaluation of head trauma rarely have intracranial injury that is evident on CT.

113 Patterns of Use of Cervical Spine Decision Rules Installed in EHR Imaging Order

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Background: The use of computerized decision support for advanced imaging orders is required in some outpatient settings but not yet in the ED. Validated clinical decision rules are shown to help guide the ordering decision of cervical spine CT imaging.

Objectives: We sought to determine if providers would voluntarily use newly embedded decision rules within a cervical spine CT electronic order more frequently than the standard method of order entry. We also had interest in which rule providers preferred when both were available.

Methods: At three hospitals, the cervical spine CT order was updated in a quality improvement project to include questions from the Canadian and NEXUS cervical spine decision rules. In each order, providers could answer questions from either rule to satisfy the order indications requirements. They could alternatively use a 'rule not appropriate' option to apply the standard method of documenting imaging indications required by the radiology department. Data were collected from each cervical spine CT order placed by ED attending physicians, residents or physician assistants during the review period. Descriptive statistics determined the proportion of orders in which the ordering provider used a decision support rule or opted out of using the rule.

Results: From 9/1/2014 thru 8/31/2015, 2022 orders were placed meeting the inclusion criteria. The ordering provider documented the use of a rule in 1257 (62%) orders. When stratified by provider role, attending physicians chose to use the rule less than half of the time (48%), whereas physician assistants and residents chose to use the rule more frequently (64% and 74%, respectively). When a rule was used, the Canadian rule was used in 638 (51%) orders and the NEXUS rule in 619 (49%) orders. The table details the breakdown of all orders placed by provider role.

Conclusion: When asked to enter indications for a c-spine CT order, providers opt to use a decision rule more frequently than the standard method of order entry. However, attending physicians used the rule less frequently when compared to physician assistants or residents. Providers who used a decision rule chose the Canadian rule and the NEXUS rule with similar frequency.

Rules Used Within Orders For Cervical Spine CT

Table 113: Gordon.

114 Variation in Hospital-Level ED Admission is Reduced After Accounting for Local and Community Factors

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Background: Hospital admission is the costliest common decision made by emergency providers. Studies have demonstrated substantial variation across providers and hospitals in the decision to admit.
Objectives: This study evaluates the variation in ED admission at the hospital level after accounting for local and community factors.
Methods: We conducted a retrospective, cross-sectional study using two years of billing records from LogixHealth. We calculated the hospital-level admission rate using multivariate logistic regression. We first adjusted for patient and provider characteristics (age, sex, primary diagnosis, case-mix [using the ten most common diagnoses as independent covariates], and provider license). We then added in hospital characteristics (annual ED volume, hospital type, hospital ownership) and county factors from the Area Health Resources Files (per capita income, uninsured rate [age <65], the number of primary care providers and). We determined the mean admission rate across hospitals and compared the range of admission rates to evaluate variation.
Results: The study sample included 1,412,300 patient encounters from 18 hospital sites in eight states. After adjusting for patient and provider factors, the overall hospital admission rate was 23.4%. Hospital-level adjusted admission rate ranged from 15.7% [95%CI 13.6-18.7] to 42.6% [95%CI 38.5-46.7]. Eight hospitals had admission rates significantly below the mean rate of 23.4% and four had rates significantly greater than the mean. After adjusting for all covariates, the overall hospital-level fully adjusted admission rate was 22.9%. Fully adjusted hospital admission rates ranged from 16.1% [95%CI 11.5-22] to 32% [95%CI 26.0-38.8]. Only the two hospitals on either extreme had admission rates that were significantly different than the mean admission rate.
Conclusion: The variation in hospital-level admission rate was reduced after controlling for hospital and community characteristics, which suggests these factors directly affect ED admission. The presence of persistent variation suggests there are other unmeasured variables that also affect admission that could be modified to reduce hospital admissions and lower healthcare costs.

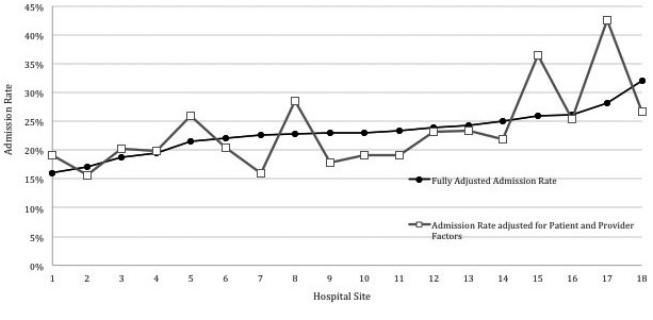

Figure 114– Honigman Warner

115 Clinical Ultrasound Fellowships: A Survey Study of Graduates' Characteristics and Career Paths

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Background: Point-of-care (POC) ultrasound (US) fellowship positions in the United States are increasing. There is little to no data on the career pathways pursued by graduates after completion of fellowship.
Objectives: In this survey study, the authors sought to define the characteristics of POC US fellowship graduates and their reported career paths after training.
Methods: This was an anonymous survey study of 597 graduates from 70 fellowships using the eusfellowships.com program list. A web-link to 26 peer-reviewed questions was sent weekly during May 2015. An introductory email was sent a week prior to the study period. No incentives were provided for completion of the questionnaire. Descriptive statistics are reported. The study was IRB approved.
Results: 336 participants completed the study for a response rate of 56%. The average age of respondents was 36.4 and 58% were male. Most graduates had M.D. degrees (89.4%), D.O. degrees (9.7%) or P.A. degrees (<1%). Sixty percent of graduates attended a 3-year emergency medicine residency and 29% attended a 4-year residency. The majority (87%) did not take time off between residency and fellowship. Only 11% pursued additional fellowships, most commonly pediatric EM (n=14) and critical care (n=3). After fellowship, 63% (95%CI, 62.9, 63.1) began work full time in an academic setting, while 24% (95%CI, 23.9, 24.1) began work full time at a community hospital. Of those in academic settings, 72% (95%CI, 71.9,72.2) were hired directly as core faculty. Thirty-three percent (95%CI, 32.7, 33.3) were hired as US division director straight out of fellowship, while 4% (95%CI, 3.7, 4.3) became fellowship directors and 3% (95%CI, 2.7, 3.3) became US medical student directors. Currently 67% (95%CI, 66-68%) identify US as their leading academic focus, while others identify administration (5%; 95%CI, 4.6, 5.4), resident education (6%; 95%CI, 5.6, 6.4), medical student education (2%; 95%CI, 1.6, 2.4) and research (2%; 95%CI, 1.6, 2.4) as their focus.
Conclusion: While not all graduates of POC US fellowships pursue academic positions, most note the impact that completing fellowship had on their career paths. Graduates hold a variety of leadership positions. About two thirds still consider US their academic focus.

116 Improved Emergency Department Quality Metrics, Patient Satisfaction Scores, and Revenue Following Implementation of Lean Flow Principles and Queuing Theory-Based Operational Changes

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Background: Emergency Department (ED) efficiency contributes to improved quality of care and hospital revenue. Our ED has a census of over 85,000 patients per year and is a level 1 pediatric trauma center. Our ED median length of stay (LOS) and left without being seen (LWBS) rate previously exceeded industry benchmarks. Patient satisfaction scores were suboptimal. Data-driven interventions based on Lean flow principles and queuing theory were used in an attempt to improve our quality metrics.
Objectives: To examine the effects of Lean flow principles and queuing theory on ED operations to improve ED LOS, LWBS rate, patient satisfaction scores, and revenue.
Methods: Demand capacity analysis and queuing theory were used to change ED operations in November 2014. Data from November 2013-October 2014 and from November 2014-October 2015 were abstracted from the electronic health record and patient survey database to evaluate effectiveness. Metric comparisons were made using χ^2 test for trends, t test, ANOVA, Mann-Whitney U Test, and odds ratios with 95% CI. Hospital revenue and work Relative ValueUnits (wRVUs) were compared. An estimate of $300 per patient was used to evaluate change in hospital revenue.
Results: Median ED LOS decreased by 25% (175 to 132 minutes) ($t = 10.91$; $p < 0.0001$). Patients were 5.6 times less likely to leave without

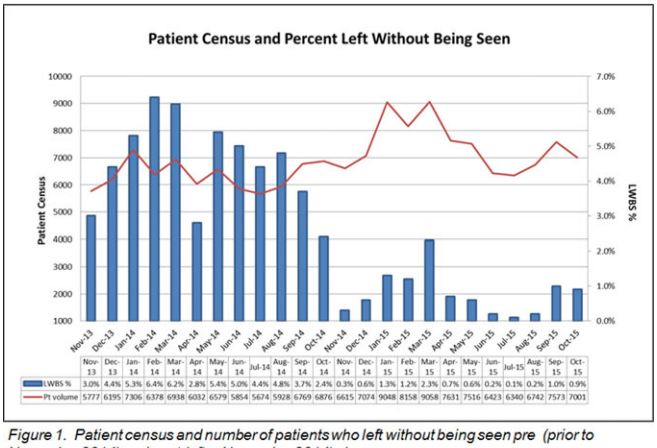

Figure 1. Patient census and number of patients who left without being seen pre (prior to November 2014) and post (after November 2014) changes.

Figure 116– Carstairs

being seen (95% CI = 5.1, 6.0) (Figure 1). Prior to implementation, we exceeded the patient satisfaction goal of 65% overall quality of care rated as "excellent" in 8.3% of the months compared to 75% of the months after implementation (p = 0.003). Over 16,000 additional patients were seen with an estimated increase in hospital revenue of $4.8 million, and we realized a 15% increase in wRVUs.

Conclusion: Utilization of data-driven decisions, demand capacity analysis, Lean flow principles, and queuing theory for ED operational changes resulted in improvements in quality metrics, wRVUS, hospital revenue, and patient satisfaction. These improvements were realized during a 15% increase in census improving access to emergency services.

117 Effect of an Electronic Medical Record Dashboard on Provider Performance of Select Clinical Efficiency Measures

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Background: We developed a dashboard in our electronic medical record (EMR) that reflects live data on door to provider contact time periods, provider contact to patient disposition time periods, and total emergency department (ED) length of stay time periods. All providers (Attendings, Residents, and Advanced Practice Providers) with ED virtual environment level EMR access can view the dashboard.

Objectives: The aim of this study is to determine whether real time access to provider-centric patient throughput metrics empowers providers to improve clinical performance efficiency.

Methods: Our dashboard was made available to all ED providers on January 1, 2015 and has been continuously available since that time. The dashboard displays select EMR gathered data for all ED providers. Only full-time ED providers were enrolled in our study. Efficiency variables were measured including Door to Provider Time (DTP) Period, Provider to Disposition Time (PTD) Period, and Total Emergency Department Length of Stay (LOS) Time Period. Six months of pre-dashboard implementation phase data (Jan 1 through Jun 30, 2014) were compared with six months post-dashboard implementation phase data (Jan 1 through Jun 30, 2015) to determine whether the availability of the dashboard positively impacted individual and group clinical performance efficiency with regards to patient throughput metrics. Student t test was used for continuous data analysis and Pearson Chi square test was used for categorical data analysis.

Results: A total of 19238 patients seen by full time providers in 2014 were compared with 18265 patients seen in 2015. The average DTP period in the pre-dashboard phase was 38±74 minutes (min) versus 18±34 min in the post-dashboard phase (p<0.001) resulting in an average decrease of 45 min of total ED LOS (330±281 min pre-dashboard versus 285±202 min post-dashboard, p<0.001). Patients triaged to high acuity levels (Emergency Severity Index 1 and 2) demonstrated average decreases of 21 min DTP period and 60 min total ED LOS period when comparing pre-dashboard versus post-dashboard phases (p<0.001). Whereas, PTD period demonstrated no significant change (188±225 min pre-dashboard versus 190±115 min post-dashboard, p=0.58) when comparing the two phases.

Conclusion: Real time ED dashboard metrics positively impact healthcare provider performance with respect to patient throughput times. Those most impacted are patients triaged to high acuity levels resulting in improvements to both ED efficiency and patient safety.

118 A Comparison of Satisfaction Scores for Patients Admitted vs. Discharged from the Emergency Department

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Background: Patients (pts) admitted to the hospital from the ED are a significant revenue source, but satisfaction surveys typically focus on patients discharged (D/C) from the ED. Because admitted patients may feel that their problem has been taken more seriously, it is unclear if satisfaction scores for D/C patients represent the overall patient experience in a given ED.

Objectives: To compare satisfaction scores between patients D/C and admitted from the ED to the hospital.

Methods: Prospective, cross-sectional study of a convenience sample of stable, oriented, consenting pts at an inner-city ED. At time of disposition, pts completed a structured, written survey providing background information and reporting satisfaction for several aspects of their experience (4-point scale; Never to Always). The primary outcome parameter was a comparison of overall satisfaction with ED care for admitted vs. D/C pts (rating of ≥8 on a 10-point VAS). Categorical data presented as frequency of occurrence, analyzed by chi-square; continuous data presented as means +/- std deviation, analyzed by t-tests (Alpha = 0.05).

Results: 626 patients enrolled (study group); 46.6% female, mean age 43.0+/-16.4 years. 32% of patients in the study group were admitted. There were no significant differences between admitted and D/C pts for the following characteristics: % Hispanic (65.4% vs. 72.1%; p = 0.30), % < $40,000 annual income (85.6 vs. 91.5%; p = 0.05); % highest level of education < high school graduate (35.1 vs. 29.4%; p= 0.42), % with private insurance (19.1 vs. 17.8%; p = 0.73), % with pain as a component of their complaint (40.3 vs. 41.2%; p = 0.84), and % who provided an answer of "always" for pain control during ED stay (59.1% vs. 58.8%; p = 0.95). There were no significant differences found for admitted vs. D/C pts for the answer "always" on the following metrics: physician courtesy/treatment (94.1 vs. 91.5%; p = 0.54), nurse staff courtesy/treatment (96.1 vs. 90.9%; p=0.14), doctor listened (90.3 vs. 89.3%; p = 0.77), doctor explained treatment (90.3 vs. 89.3%; p = 0.77). Primary outcome parameter of overall care (score ≥ 8) scores were similar for admitted vs. D/C pts (91.5 vs 86.8% p = 0.14).

Conclusion: We found satisfaction scores similar between admitted and D/C ED pts.

119 A Triple Burden of Disease Revealed by Pilot Prospective Registry in a Major East Africa Accident and Emergency Department

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Joseph Hospital, Denver, CO; [3]Kenyatta National Hospital, Nairobi, Kenya; [4]University of Virginia School of Medicine, Charlottesville, VA; [5]University of Nairobi School of Medicine, Nairobi, Kenya; [6]Hennepin County Medical Center/University of Minnesota, Minneapolis, MN

Background: Resource limited settings are increasingly experiencing a "triple burden" of disease, that is, trauma and non-communicable diseases in addition to known communicable disease patterns. However, the epidemiology is not well characterized and this limits efforts to further develop emergency care capacity.

Objectives: To define the burden of disease by describing the patient population presenting to the Accident and Emergency Department (A&E) at Kenyatta National Hospital (KNH).

Methods: We analyzed data from the prospective pilot registry "Emergency Medicine Registry of Kenya" (EMROK) obtained via systematic sampling over two months in KNH's A&E. Research assistants collected data directly from patients and their charts. Chief complaint and diagnosis codes were grouped for analysis. We calculated the mean and standard deviation for age and proportions for categorical variables.

Results: Data were collected on 402 patients with an average age of 36 years (SD 19) and who were 50% female. Patients were most likely to arrive via taxi or bus (39%), walking (28%) or ambulance (17%). Twenty-one percent of patients were considered emergency or very urgent and 35% were routine. The five most common chief complaint categories were trauma/injury (22%), cardiovascular/chest pain (8%), abdominal pain (8%), gastrointestinal complaint (7%), and other pain (4%). The five most common disposition diagnosis categories were trauma/injury (24%), gastrointestinal complaint (9%), infectious disease (7%), cardiovascular/chest pain (6%), and abdominal pain (5%). Of the trauma and injury category, 27% were head injury, 16% fracture/dislocation, and 15% assault. Sixteen percent of patients were admitted after evaluation.

Conclusion: This pilot registry is the first prospective study to describe the A&E population at a tertiary center in Kenya and highlights the triple burden of disease. Our findings emphasize the need for further development of Emergency Medicine resources and training to better address patient needs in resource limited settings such as KNH.

120 Assessing the Patient Experience of Care at Freestanding Emergency Departments Affiliated with Academic Hospitals

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Background: The first goal of the Institute of Healthcare Improvement (IHI) Triple Aim Initiative is to "improve the patient experience of care (including quality and satisfaction)". Freestanding emergency departments (FEDs) are expanding rapidly in the United States. In 2015, there were 387 FEDs affiliated with hospitals and 172 independent FEDs.

Objectives: We evaluated patient satisfaction and treatment times to assess the performance of FEDs in meeting the IHI triple aim goal of improving patient's experience. We theorized treatment times would be faster and patient satisfaction would be higher at the FEDs.

Methods: A retrospective review of 108,202 patient charts using electronic health records and facility reports to the Center for Medicare and Medicaid Studies for patients seen in 2013 and 2014 at four academic FEDs in two states.

Results:

Conclusion: Compared to national averages, academic FEDs had shorter wait times, treatment times and higher patient satisfaction. Academic FEDs treated a lower percentage of emergent and resuscitation patients, but treated a higher number of urgent and semi-urgent acuity level patients. Door to diagnostic evaluation and time to pain medication for long bone fractures was quicker at the Utah FED and were comparable to the national average at the Akron General-Cleveland Clinic FEDs.

121 Modeling Hourly Resident Productivity

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Background: Resident productivity, defined as the number of patients seen per hour, has important implications for ED operations. In high-volume academic centers, essential staffing decisions are based on the assumption that residents see a predictable, static number of patients per hour. However, it is unclear if this model mirrors reality. Studies have examined productivity by PGY year and specialty, but studies examining productivity over the course of a shift have been few and of limited scope.

Objectives: We examined the rate at which residents evaluated new patients over each hour in the course of a shift in order to determine if their productivity followed a consistent pattern. We also examined whether the pattern of new patient accrual was consistent between shifts, or if there was significant variability based on training year or time of day.

Methods: This was a retrospective cohort study, conducted in an urban academic hospital ED, with a 3-year EM training program in which residents are at liberty to pick up patients throughout a shift.

Acuity Levels	National Average for 2013	Akron General FEDs	University of Utah FED
Level 1 - Resuscitation	2%	0.17%	0.1%
2 - Emergent	8	6.15	3.27
3 - Urgent	31	49.23	57.36
4 - Semiurgent	35	44.05	30.27
5 - Nonurgent	24	0.33	3.34
	National Average 2014 (time in minutes)	Akron General FEDs (time in minutes)	University of Utah FED (time in minutes)
Wait Time (median minutes to provider)	27	15.62	2.46
Treatment Time for discharged patients (OP-18a)	146	110	142.12
Treatment Time for Admitted patients (OP-18d)	289	210	243.5
Median Time from Door to Diagnostic Evaluation by a Qualified Medical Provider (OP-20)	24	24.8	20.95
Time to pain medication for long bone fracture (OP-21)	54	55	41
Patient Satisfaction	50th percentile	95th	99th

Table 120: Simon.

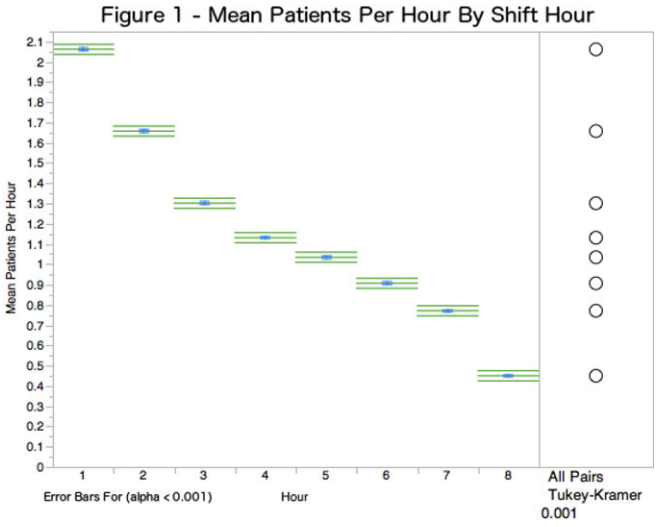

Figure 121– Joseph

Consecutive resident shifts were evaluated for the number of new patients per hour, as timestamps of all patient encounters are automatically logged in an observational database. The mean patients seen at each shift hour were compared via one-way ANOVA and post-hoc Tukey-HSD to control for multiple comparisons.

Results: There were 14,432 resident shifts evaluated from 7/1/10 to 6/20/15. The overall mean patients seen per hour was 1.16 (99% CI 1.15 - 1.17), with 2.06 (99% CI 2.03 - 2.09) seen in the first hour and 0.44 (99% CI 0.43 - 0.45) in the eighth. There was a significant decrease in the mean new patients seen every hour, with all-pairs Tukey-HSD significant at $p < 0.001$ [fig 1]. This decrease was greatest after the first (-0.40, 99% CI -0.45 to -0.36), second (-0.33, 99% CI -0.40 to -0.31), and seventh hours (-0.32, 99% CI -0.37 to -0.27). Controlling for time of day and PGY year, the decline remained significant between every hour, and most prominent over the transitions from first, second, and final hours of the shift.

Conclusion: EM Resident productivity over a single shift follows a reliable pattern, decreasing significantly on an hourly basis, most prominently at and in anticipation of transitions of care. This pattern is preserved across all PGY years and shift times.

122 Impact of Scribes: A Systematic Review and Meta-Analysis

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[1]Mayo Clinic, Rochester, MN; [2]Harris Methodist Hospital, Fort Worth, TX

Background: Scribes offer a potential solution to the increasing clerical burden and time constraints felt by health care providers. Limited peer reviewed literature is published on the impacts of scribes; however, several editorials praise their contributions.

Objectives: We conducted a systematic review and meta-analysis to evaluate the effect of scribes on patient throughput, revenue, and patient and provider satisfaction.

Methods: Six electronic databases were systematically searched from inception until May 2015. There were no restrictions to language, healthcare settings or type of patients. We included studies where clinicians (attendings, residents or NP/PA) utilized a scribe. We collected throughput metrics, billing data and information regarding impact on patient and provider satisfaction. Meta analyses were conducted with random effects and mean differences calculated with 95% confidence intervals (CI).

Results: From a total of 210 titles, 17 studies were eligible and included in this review. Fourteen of the studies were conducted in an ED, two in out-patient clinics and one on a hospital ward. The studies had moderate to high risk of bias. Eight studies described scribe impact on satisfaction; qualitative results suggest improvement in provider and patient satisfaction. Meta-analysis revealed no scribe impact on patient length of stay (average 345.5 min for scribes and 344.2 min for non scribes; mean difference -1.6 min, 95% CI -22.3 to 19.2 min) or provider to disposition time (average 235 min for scribes and 216 for non scribes; mean difference -18.8 min, 95% CI -22.3 to 19.2). There was an increase in 0.21 (95% CI 0 to 0.42) relative value units (RVU) per patient with the use of scribes. There was an increase in the number of patients seen per hour (0.17 more patients per hour; 95% CI 0.02 to 0.32).

Conclusion: We found no difference in length of ED stay or time to disposition. There might be a benefit on revenue and patient/provider satisfaction. There is an increase in the number of patients per hour seen when using scribes in the ED. Additional research to understand of the impact of scribes on the health care team and the patient experience is needed to fully grasp the value of this group of providers.

123 Applying LEAN to Improve Throughput Metrics in a Pediatric Emergency Department

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SUNY Downstate Medical Center / Kings County Hospital, Brooklyn, NY

Background: LEAN methodology is a strategy historically used in manufacturing, although now common in healthcare, to streamline flow, improve processes and increase efficiency. LEAN focuses on eliminating waste to improve efficiency. Wait times and prolonged length of stay, common ED problems, leads to decreased quality of care and inefficient utilization of resources and are optimal targets for LEAN improvement tools.

Objectives: We utilized a LEAN methodology to reduce Door-to-Provider Time in an urban pediatric emergency medicine department (PED). We hypothesize that applying LEAN in our PED using a Rapid Improvement Event (RIE) would improve door-to-provider time, and total length of stay (TLOS).

Methods: We conducted a before-and-after intervention design to study the effect of instituting a front end process redesign for patients presenting to our urban PED with an annual volume of approximately 29,000 visits. The process redesign, developed by a multidisciplinary team of front line staff, including MDs, RNs and clerks, focused on immediate placement of patients in open beds when available and bedside triage. We compared the median of several metrics, 12 months prior to implementation (July 2014 - June 2015) to three months after implementation (August 2015 - October 2015). Outcome measures included time from door-to-triage, door-to-provider, and total length of stay. Pre and post intervention groups were compared using Mann-Whitney U Test (2 tails, alpha= 0.05). All data were presented as median and IRQ (25%, 75%).

Results: A total of 28845 pediatric ED visits in the pre-intervention group were compared to 6362 visits in the post-intervention group. There was a statistically significant decrease in door-to-provider time from 51 to 32 minutes after the intervention. In addition, there was a statistically significant decrease in door-to-triage from 27 to 23 minutes, triage-to- provider from 18 to 6 minutes, and with total length of stay from 151 to 129 minutes.

Conclusion: The application of LEAN via a RIE can decrease door-to-provider time and other throughput metrics without an increase in physician or nursing staff resources. Use of front line staff in developing standards is a common and important LEAN principle.

	Pre-Intervention	Post-Intervention	p-value
Door-to-Provider	51 min (30, 85)	32 min (18, 56)	P<0.001
Door-to-Triage	27 min (19, 40)	23 min (17, 33)	P<0.001
Triage-to-Provider	18 min (4, 49)	6 min (-3, 27)	P<0.001
TLOS	151 min (100, 220)	129 min (82,196)	P<0.001

Table 123: Agoritsas.

124 Comprehension of Video Versus Standard Written Instructions for Patients Discharged with a Diagnosis of Abdominal Pain from an Inner City Emergency Department

Brandon Price[1], K. Tom Xu[2], Albert Gest[1], Lynn Carrasco[1], Cynthia Smith[1], Jose Guardiola[3], and Peter B. Richman[1]
[1]Texas A&M Health Science Center/Christus Spohn, Corpus Christi, TX; [2]Texas Tech University, Lubbock, TX; [3]Texas A&M University/Corpus Christi, Corpus Christi, TX

Background: Prior research suggests that patients of lower socioeconomic/education status are at higher risk for non-compliance with medical treatment and worse disease outcomes. Abdominal pain is one of the most frequent presenting chief complaints and common reasons for return visit to the ED.

Objectives: To assess the effectiveness of video vs. written discharge (D/C) instructions on comprehension by inner city ED patients (pts) with abdominal pain.

Methods: Prospective, clinical trial in an academic inner-city ED. Study conducted during hours at which the principal investigator or trained research associates available (convenience sample). Consenting, English speaking, oriented adults >17 years with a final diagnosis of abdominal pain were included; unstable pts excluded. Pts received either A) video D/C instructions or B) written D/C instructions according to an alternating week schedule. Pts subsequently answered 10 closed questions to assess comprehension of instructions. Categorical data presented as a frequency of occurrence; analyzed by Chi square. Continuous data presented as a means +/- SD; analyzed by t-tests. A sample of size of 63 in each group required for an 0.80 power to detect a 1-point difference in mean test scores. Primary outcome parameter was to compare the mean comprehension post-test score between the video vs. written groups.

Results: 140 pts enrolled; 58% female, mean age 42+/-16 years, 79% Hispanic, 89% < $40k annual income, 36 in the video group. Bivariate analysis revealed mean scores were significantly lower for patients who received video vs written instructions (6.6+/-2.3 vs. 7.6+/-1.7; p=0.008). No significant difference in scores based on gender, race, income level, education status, insurance type. Age inversely correlated with better comprehension scores (-0.17; p=0.44). Multivariate analysis to control for confounding factors revealed that lower mean scores for pts who received video vs. written instruction remained significant (p=.0.031). Other variables that were associated in the model with lower scores: male gender (p=0.047), older age (p=0.03), Hispanic race (p=0.004).

Conclusion: In contrast to prior studies, we found that pts who received video D/C instructions had significantly lower comprehension scores than pts receiving written instructions for abdominal pain.

125 Are There Differences in Survival Between Neighbourhoods for Out-of-Hospital Cardiac Arrest in Vancouver, British Columbia?

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Background: Out-of-hospital cardiac arrest (OOHCA) is a leading cause of mortality in North America. No prior work exists examining the relation between the geographic distribution of OOHCA in the Vancouver area and possible clustering of cases.

Objectives: To determine whether there is different survival between different neighbourhoods for OOHCA. To determine whether there are different rates of CPR for OOHCA cases in public and private locations.

Methods: This was a retrospective cohort study of patients registered in the Vancouver Coastal Health regional out-of-hospital cardiac arrest database. The database contains information from the ROC network, and structured chart reviews from 4 hospitals. Census data from Statistics Canada was used with single variable Kernel Density surfaces and regression tree analyses to examine different relationships in an exploratory analysis.

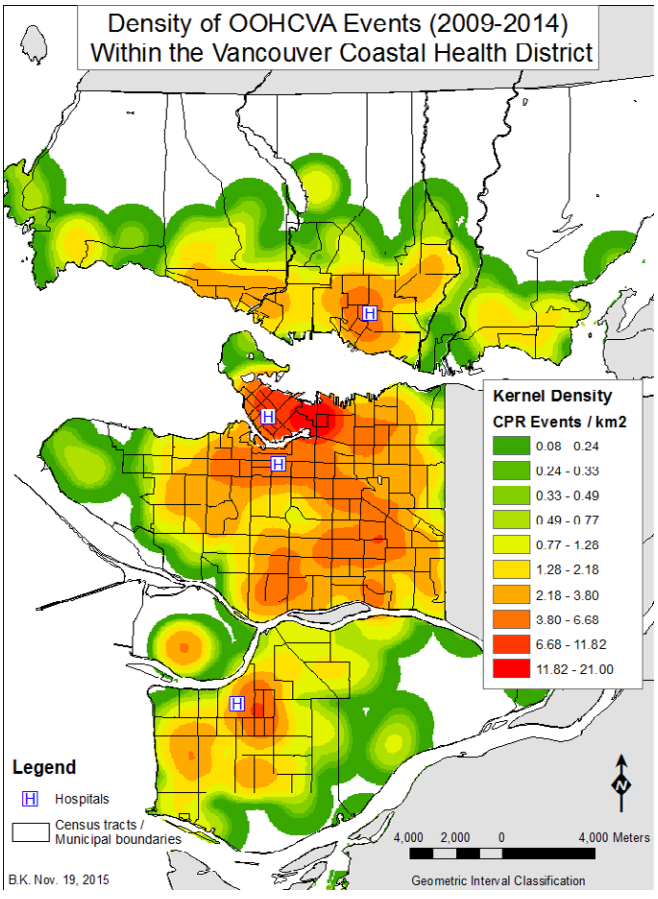

Figure 125 – Barbic

Results: We examined 1617 cases of OOHCA with an overall mortality rate of 86.5%. The mean age of OOHCA cases was 66.6 years and 33.6% were female. The proportion of patients with an initial shockable rhythm (VT/VF) was 22.2%, and 42.3% of all cases received bystander CPR. The rate of survival to hospital discharge with favourable neurological status (FNS) was 10.5%. For patients transported to hospital by EMS, distance of transport to one of four regional cardiac arrest hospitals was a significant predictor of survival to discharge with FNS. Median income of individual census tracts alone, did not predict survival with FNS. The exclusion of the 2 census tracts with the highest median income, and those with the lowest median income in this dataset had no impact on FNS survival rates. OOHCA cases occurring in low median income census tracts were more likely to receive public bystander CPR, than those occurring in high median income census tracts. OOHCA cases occurring in high median income census tracts were more likely to receive CPR in a private residence or private setting.

Conclusion: There was no difference in survival between census tracts in Vancouver. Rates of bystander CPR were higher for public arrests in low income census tracts, and for private arrests in high income tracts. Future work to explore trends at a provincial level may lead to more focused efforts at CPR education.

126 Near-Infrared Spectroscopy Monitoring During Cardiac Arrest: A Systematic Review and Meta-Analysis

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Universite de Montreal, Montreal, QC, Canada

Background: Tissue oximetry using near-infrared spectroscopy (NIRS) is a non-invasive monitor of cerebral oxygenation. This new technology has been used during cardiac arrest because of its ability to give measures in low blood flow situations.

Objectives: The aim of this systematic review was to assess the evidence regarding the association between NIRS values and resuscitation outcomes in patients undergoing cardiopulmonary resuscitation. We hypothesized that higher NIRS values would be associated with better outcomes and that the strength of that association would differ depending on the timing of the NIRS measurements.

Methods: Medline, Embase and CENTRAL were searched from their inception to September 18th 2015 using a specifically designed search strategy. Grey literature was also searched using Web of Science and Google Scholar. NIRS manufacturers and authors of included citations were contacted to inquire on unpublished results. Finally, the references of all retained articles were reviewed in search of additional relevant studies. Studies reporting NIRS monitoring in adults during cardiac arrest were eligible for inclusion. Case reports and case series of fewer than five patients were automatically excluded. Two reviewers assessed the quality of included articles and extracted the data.

Results: Out of 3275 unique citations, 19 non-randomized observational studies (15 articles and four conference abstracts) were included in this review, for a total of 2436 patients. Six studies were evaluated at low risk of bias, nine at intermediate risk and four at high risk. We found a stronger association between the return of spontaneous circulation (ROSC) and the highest NIRS value measured during resuscitation (standard mean deviation (SMD) 3.46 (95%CI 2.31-4.62)) than between ROSC and the mean NIRS measures (SMD 1.33 (95%CI 0.92-1.74)) which was superior to the one between ROSC and initial measures (SMD 0.45 (95%CI 0.02-0.88)) (see Cournoyer Figure 1).

Conclusion: Patients with good outcomes have significantly higher NIRS value during resuscitation than their counterparts. The association between ROSC and NIRS measurements was influenced the timing of measurements during resuscitation.

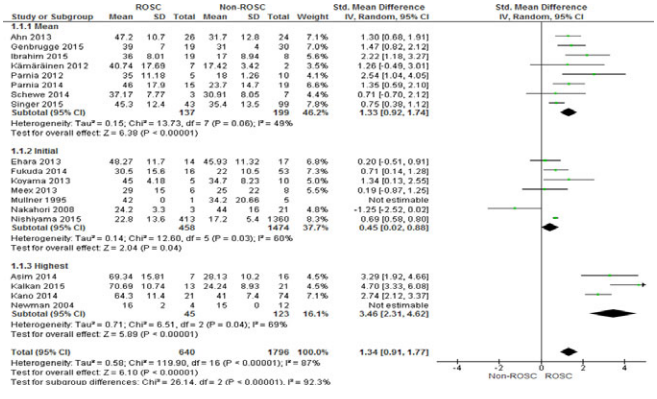

Figure 126 – Cournoyer

127 Comparison of Hydroxocobalamin Versus Norepinephrine Versus Saline in a Swine Model of Severe Septic Shock

Joseph Maddry[1], Normalynn Garrett[2], Susan Boudreau[2], Maria Castaneda[2], Vikhyat Bebarta[3], and Patricia Dixon[4]

[1]Chief, Medical Toxicology, CREST Research Program, Department of Emergency Medicine, San Antonio Military Medical Center, Director, Enroute Care Research Center, U.S. Army Institute of Surgical Research, San Antonio, TX; [2]CREST Research Program, Department of Emergency Medicine, San Antonio Military Medical Center, San Antonio, TX; [3]University of Colorado, Anschultz School of Medicine-Emergency Medicine, Aurora, CO; [4]59th Clinical Research Division, San Antonio, TX

Background: Sepsis is associated with a mortality of nearly 30%. Mortality is due, in part, to an uncontrolled inflammatory response. Matrix metalloproteinase-9 (MMP-9) and heat shock protein 70 (HSP 70) have been suggested to be biomarkers of severe sepsis and may be useful indicators of treatment success. Hydroxocobalamin (HOC), which regulates inducible nitric oxide synthase and increases systemic vascular resistance, may be effective in treating sepsis-induced hypotension and reversing overexpression of inducible nitric oxide synthase.

Objectives: To compare efficacy of HOC versus norepinephrine (NOR) versus saline in swine with lipopolysaccharide (LPS)-induced endotoxemia.

Methods: Swine (45-55 kg) were anesthetized, intubated, and instrumented with continuous femoral and pulmonary artery pressure monitoring. Endotoxemic shock, defined as a 50% decrease in mean arterial pressure (MAP) compared to baseline, was established with a two hour escalating infusion of LPS (5-60 mcg/kg/hr) followed by a continuous infusion of LPS (20 mcg/kg/hr). MAP remained at 50% of baseline for one hour before treatment ensued. Animals received either 200 mg/kg bolus of HOC followed by a maintenance infusion of 15 mg/kg, NOR infusion titrated to maximize MAP and maintain HR less than 180 BPM, or saline (1.5 mg/kg/hr). A sample size of 10 animals per group was determined based on a power of 80% and an alpha of 0.05 to detect a difference between groups using repeated measures MANOVA.

Results: We previously reported that HOC and NOR were comparable in supporting MAP and significantly better than saline ($p<0.01$). We now report whereas MMP-9 or HSP 70 values were not significantly different at baseline between groups ($p=0.4$; 0.13), nor was there a difference between groups after two hours of LPS infusion ($p=0.5$; 0.3), there was a significant within group difference such that LPS increased MMP-9 and HSP 70 over time ($p<0.01$; 0.01) prior to treatment. After treatment MMP-9 values fell significantly in the HOC group compared to the other groups ($p<0.02$) and HSP 70 decreased in the HOC and NOR groups compared to saline treatment ($p<0.05$).

Conclusion: An infusion of intravenous HOC appears to be comparable to NOR in decreasing biomarkers associated with severe LPS-induced endotoxemic shock and significantly better compared to saline in our experimental animal model.

128 Point-of-Care Cardiac Ultrasound during Advanced Cardiac Life Support Simulation is Associated with Longer Pulse Check Time

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Background: Point-of-care cardiac ultrasound (POCUS) has become an important adjunct in emergency medicine practice but its efficacy and safety in cardiopulmonary resuscitation remains unknown.

Objectives: To determine whether simulated cardiac POCUS use during CPR simulations was associated with longer hands-free intervals during pulse checks and whether cardiac ultrasound-enhanced pulse checks were compliant with published guidelines.

Methods: This was a post-hoc analysis of data derived from a randomized, controlled, participant-blinded trial of a novel pulse check technique. Subjects were emergency medicine residents and physician assistants assigned to 5-member teams for 13-15-minute "megacode" simulations. All pulse checks were video recorded and time-coded. For this analysis, hands-off durations of cardiac "ultrasound-enhanced" pulse checks were compared to "ultrasound-free" pulse checks. Cardiac ultrasound was simulated by a handheld tablet provided by a confederate. When teams requested POCUS, a 6 second looping video was immediately provided, displaying a heart in PEA arrest in the parasternal long axis for as long as the teams wished. Teams could request POCUS multiple times, if desired.

Results: 50% (3/6) of the teams used cardiac POCUS during pulse checks (mean # of uses=2.67, range= 1 to 4 uses). The mean pulse check time for ultrasound-enhanced pulse checks was 13.5 seconds (95% CI 11.4-15.6) vs. 9.2 seconds (95% CI 7.7-10.6) in ultrasound-free pulse checks, with a mean difference of 4.3 seconds (95% CI 1.7-6.9, p<0.003). 57% of ultrasound-free pulse checks were shorter than the 10s pulse check ceiling recommended by the American Heart Association vs. 13% of ultrasound-enhanced pulse checks (p=0.04). 38% of ultrasound-enhanced pulse checks exceeded 15s vs. 5% in ultrasound-free pulse checks (p=0.05). The fastest 30% of pulse checks were performed during ultrasound-free pulse checks.

Conclusion: Quantitative and qualitative observations demonstrated that simulated cardiac ultrasound-enhanced pulse checks during simulated resuscitations were associated with longer pulse check times which frequently exceeded published guidelines.

129 Association Between Compression Rates During Cardiopumonary Resuscitation and Clinical Outcome

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Background: Recent guidelines for management of cardiac arrest recommend chest compression rates of 100-120 compressions/min. However, animal studies have found cardiac output to increase with rates up to 150 compressions/min.

Objectives: The objective of this study was to test the association between in-hospital chest compression rates and outcome.

Methods: We conducted a prospective observational study at a single academic medical center. Inclusion criteria: age ≥18, non-traumatic cardiac arrest, cardiopulmonary resuscitation performed by hospital personnel. We analyzed chest compression rates measured by defibrillation electrodes, which recorded changes in thoracic impedance. The primary outcome was return of spontaneous circulation (ROSC). We used multivariable logistic regression to determine odds ratios for ROSC by chest compression rate categories (<100, 100-120, 121-140, >140 compressions/min), adjusted for chest compression fraction (proportion of time chest compressions provided) and other factors known to predict outcome. We set 100-120 compressions/min as the reference category for the multivariable model.

Results: We enrolled 232 consecutive patients and found a mean chest compression rate of 138±18 (range 98-188). Overall 50% achieved ROSC; among <100, 100-120, 121-140, and >140 compressions/min, ROSC was 10%, 28%, 63%, and 48% respectively. A chest compression rate of 121-140 compressions/min had the greatest likelihood of ROSC, odds ratio 4.45 (95% CI 1.53-12.92).

Conclusion: In this sample of adult cardiac arrest patients who received chest compressions from hospital personnel, chest compression rate of 121-140 compressions/min had the highest odds ratio of ROSC. Rates above the currently recommended 100-120 compressions/min may improve the chances of ROSC among cardiac arrest patients.

130 The Effect of Therapeutic Hypothermia on Arrhythmia Substrates During Resuscitation in a Model of Ischemic Cardiac Arrest

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Background: As targeted temperature management is recommended for comatose post arrest patients, it is important to understand the effect of temperature on the resuscitated heart. Previously, we observed that *ex vivo*, therapeutic hypothermia (TH) preserves ventricular conduction and dispersion of repolarization (DOR) during ischemia, mitigating substrates for VF. However, TH's effects *in vivo* during resuscitation are unknown. We developed a model of resuscitation from ischemic cardiac arrest, and TH decreased re-VF in ischemia but increased re-VF at reperfusion.

Objectives: To determine the effect of TH on ventricular conduction and DOR *in vivo* during resuscitation.

Methods: Anesthetized adult pigs underwent thoracotomy to place multipolar plunge electrodes in the infarct (IZ), noninfarct (NIZ) and border zone (BZ) of the left ventricle. Animals were maintained at control (CT=37°C, n=7) or TH (33°C,n=5). The LAD was occluded until VF occurred by 30 min. ACLS was started to achieve ROSC and the LAD was reperfused at 60 min. Activation Recovery Intervals (ARIs), a representative of the focal action potential duration, determined regional and transmural ventricular activation and repolarization.

Results: At baseline, TH prolonged ARIs in all regions and slowed global conduction (36±5ms TH vs. 17±1ms CT p=.02), but did not affect global DOR (88±6ms TH vs. 79±10ms CT p=NS). By 6 minutes of ischemia, ARIs remained prolonged in the NIZ and BZ with TH but not within the IZ, increasing global DOR (282±18ms TH vs. 185±29ms CT p=.018). During ischemia, global conduction slowed in both groups (75±6ms TH vs. 65±11ms CT p=NS), but there were no differences in global ventricular conduction post-ROSC or during LAD reperfusion. The effect of TH on these arrhythmia substrates could not explain differences in VF susceptibility previously observed post ROSC or after reperfusion.

Conclusion: TH induces dynamic arrhythmia substrates throughout resuscitation. Improved understanding of arrhythmia substrates during different phases of resuscitation are needed to develop a more tailored antiarrhythmic approach to improve resuscitation.

131 Chest Compressions Over the Left Ventricle Improve End Tidal Carbon Dioxide Levels While Using Resuscitative Endovascular Balloon Occlusion of the Aorta in a Swine Model of Traumatic Cardiac Arrest

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Background: Closed chest compressions (CC) directly over the left ventricle (LV) during traumatic cardiopulmonary arrest (TCPA) has been reported to improve hemodynamics and return of spontaneous circulation (ROSC) when compared to standard CCs. Resuscitative endovascular balloon occlusion of the aorta (REBOA) is also able to improve hemodynamics as well as control hemorrhage during TCPA.

Objectives: We hypothesized that the combination of REBOA and closed CCs located over the LV would result in a higher coronary perfusion pressure (primary outcome) in our swine model of traumatic cardiac arrest. Secondary outcomes included ROSC and other hemodynamic variables including blood pressure, cerebral and renal oximetry, and end-tidal CO2 (ETCO2).

Methods: Transthoracic echo was used to mark the location of the aortic root and the center of the left ventricle on animals (n=26) which were randomized to receive CCs in one of the two locations. A REBOA catheter was placed in Zone 1 of the aorta in each animal. One third of each animal's blood volume was then removed and ventricular fibrillation (VF) was induced to simulate traumatic cardiac arrest. After a period of ten minutes of VF, basic life support (BLS) with mechanical CPR was initiated and performed for ten minutes followed by advanced life support (ALS) and blood transfusion for an additional ten minutes. The REBOA balloons were inflated at minute 6 of BLS. Hemodynamic variables were averaged every two minutes; analysis of variance with

Bonferoni correction was used to determine if hemodynamic variables were significantly different between groups during the BLS and ALS periods. Fisher's exact test was used to determine the difference in return of ROSC.

Results: There was no difference in baseline measures between the two groups. ETCO2 was higher during all time intervals of BLS among LV CC animals with REBOA compared to Standard CC animals with REBOA ($p \leq 0.05$), however, other hemodynamics were not significantly different. In the LV CC group 9 animals attained ROSC, while in the LV CC group only 4 animals attained ROSC (p=0.24).

Conclusion: In our swine model of TCPA with REBOA, only ETCO2 was increased by performing CCs over the LV rather than the standard location. Although ETCO2 is generally a predictor of ROSC, the difference in ROSC was not significant in our model.

132 Cytochrome C Levels in Post-Cardiac Arrest Patients

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Background: Cytochrome *c* is an essential component of the electron transport chain loosely bound to the inner mitochondrial membrane. Plasma cytochrome *c* levels has been shown to be elevated and associated with mortality in an animal model of cardiac arrest.

Objectives: The objectives of the current study were to establish whether there are detectable plasma levels of cytochrome *c* in post-cardiac arrest patients, whether there is an association between cytochrome *c* levels and lactate/inflammatory markers, and whether higher cytochrome *c* levels are associated with poor outcomes

Methods: We enrolled adult, out-of-hospital cardiac arrest patients who were comatose after return of spontaneous circulation at four tertiary care centers in the United States. Blood draws were performed as soon as possible after return of spontaneous circulation. We also performed blood draws in controls without acute or chronic illness. We measured plasma cytochrome *c* levels by applying the human cytochrome *c* Platinum ELISA (eBioceience, CA) kit to a MSD platform (Meso Scale Discovery, MD). Interleukin (IL)-1 receptor antagonist, IL-6, IL-8, IL-10 were measured with a Millipore Milliplex Human Cytokine Panel (EMD Millipore, Billerica, MA, USA). We compared groups using the Wilcoxon Rank-Sum test. We used Spearman's correlation coefficient (r_s) to assess the correlation between cytochrome *c* levels and initial lactate levels/inflammatory markers.

Results: A total of 102 post-cardiac arrest patients and 34 controls had cytochrome *c* levels measured. Cardiac arrest patients had higher 0 hour cytochrome *c* levels as compared to controls (2.18 ng/mL [0.74, 7.74] vs. 0.16 ng/mL [0.03, 0.91], $p < 0.001$, Figure 1a). Cytochrome *c* levels in post-cardiac arrest patients were weakly correlated with initial lactate levels ($r_s = 0.36$, $p < 0.001$) as well as inflammatory markers (r_s between 0.36 and 0.40, all $p < 0.001$). Fifty-five (54%) patients in the cardiac arrest group died. Patients who died had higher 0 hour cytochrome *c* levels as compared to survivors (3.66 nmol/L [1.40, 14.9] vs. 1.27 nmol/L [0.16, 2.37], $p < 0.001$, Figure 1b).

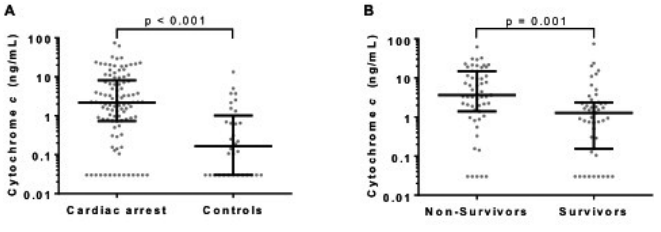

Figure 132 – Donnino

Conclusion: Cytochrome C levels are elevated in post-cardiac arrest patients and non-survivors have higher levels.

133 Remote Ischemic Conditioning to Reduce Reperfusion Injury During Acute STEMI: A Systematic Review and Meta-Analysis

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Background: Remote ischemic conditioning (RIC) is a non-invasive therapeutic strategy that uses brief cycles of inflation and deflation of a blood pressure cuff to reduce ischemia-reperfusion injury during acute ST-elevation myocardial infarction (STEMI).

Objectives: The primary objective of this systematic review was to determine if RIC initiated prior to catheterization increases myocardial salvage index, defined as the proportion of area at risk of the left ventricle salvaged by treatment following emergent percutaneous coronary intervention (PCI) for STEMI. Secondary outcomes included infarct size and major adverse cardiovascular events.

Methods: Electronic searches of Medline, EMBASE and Cochrane Central Register of Controlled Trials were conducted and reference lists were hand-searched. Randomized controlled trials comparing PCI with and without RIC for patients with STEMI published in English were included. Two reviewers independently screened abstracts, assessed quality of the studies, and extracted data. Data were pooled using random-effects models and reported as mean differences (MD) and risk ratios (RR) with 95% confidence intervals (CIs).

Results: Nine RCTs were included with a combined total of 999 patients (RIC+PCI = 534, PCI = 465). The myocardial salvage index was higher in the RIC+PCI group at 3 and 30 days; mean difference 0.09 (95% CI: 0.04, 0.15) and 0.12 (95% CI: 0.03, 0.21), respectively. Infarct size was reduced in the RIC+PCI group at 3 and 30 days; mean difference -3.82 (95% CI: -8.15, 0.51) and -4.00 (95% CI: -7.07, -0.93), respectively. There was no statistical difference with respect to death and re-infarction, however there was a reduction in heart failure with RIC+PCI at 6 months; RR: 0.43 (95% CI: 0.19, 0.99).

Conclusion: RIC is emerging as a promising adjunctive treatment to PCI for the prevention of reperfusion injury in STEMI patients. Ongoing, multicenter clinical trials will help elucidate the effect of RIC on clinical outcomes such a hospitalization, heart failure and mortality.

134 Older Adults and High Risk Medication Administration in the Emergency Department: Who is at Risk?

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Background: The older adult population is susceptible to the adverse effects of many medications administered in the emergency department (ED). Opioids, non-steroidal anti-inflammatory drugs (NSAIDs) and benzodiazepines (BZDs) are associated with significant morbidity in older adults when used in doses administered to younger adults.

Objectives: We investigated the frequency of elevated dosing of opioids, NSAIDs and BZDs in older adults in the ED.

Methods: Patient records were queried for administration of the above medication classes to patients aged 65 and older in two tertiary care EDs over a 6-month period (Aug 14-Feb 15). Recommended and elevated doses of opioids, NSAIDs and BZD were determined based on established recommended practices. "High doses" were defined as doses 1.5-3 times higher than the recommended dose of a medication. "Very high doses" were defined as any doses that were greater than high. Frequency of recommended versus elevated doses given to patients 65 and older were compared by age (65-69 "young-old" vs ≥ 85 "old-old") and gender.

Results: A total of 17896 visits, representing 11374 unique patients 65 and older (55.3% M, 44.7% F), were identified at both centers during the study period. A total of 3392 doses of interest were administered to 1364 different patients with 2359 doses being elevated (1637 high doses, 722 very high doses). Focusing on the doses as the variable of interest, the young-old (1477 doses given, 81.5% elevated) had an increased risk of receiving elevated doses compared to the old-old (384 doses given, 47.9% elevated) over all medication groups (RR 1.7 [1.6-1.8]). NSAIDs (RR 1.6 [1.2-2.2]), opioids (RR 1.8 [1.6-1.9]) and BZDs (RR 1.3 [1.1-1.4]) were all given at higher doses to the young-old. Men were more likely than women to receive elevated doses of any medication (RR 1.2 [1.2-1.3]), most frequently BZDs (RR 1.4 [1.3-1.6]). Very high doses were administered to the young-old much more frequently than to the old-old (RR 6.2 [4.7-8.1], 29.3% vs 5.7% of total doses). This difference was mainly due to elevated opioid dosing in the young-old (RR 8.6 [6.4-12.1]).

Conclusion: The prescribing of elevated doses of NSAIDs, opioids and BZDs in the older population occurs frequently in the ED. Elevated dosing puts this population at greater risk of adverse effects. Higher doses of these medications are more frequently given to the young-old and men.

135 Prehospital and Emergency Department Predictors of Toxicity in Pediatric Bupropion Exposures

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Background: Bupropion is an antidepressant, structurally similar to amphetamines. It inhibits the reuptake of dopamine, norepinephrine, and serotonin and has weak anticholinergic properties. Seizures and agitation are known complications in both therapeutic doses and overdose.

Objectives: The objective of this study was to associate patient heart rate and bupropion dosage with the rate of seizures in pediatric bupropion exposures.

Methods: This is a retrospective case series of calls to the California Poison Control system for pediatric (<18 years old) bupropion ingestions from 2002-2012. The California Poison Control System Database was queried for all bupropion ingestions. Cases of polysubstance ingestion were excluded. Data for age, sex, ingested dose, initial heart rate, and seizures were extracted. Tachycardia was defined by age. Rates of seizures were compared in those with and without initial tachycardia. A subgroup analysis of two year olds was done to correlate HR with dose/kg while controlling for age.

Results: 821 pediatric bupropion ingestions were identified. 83 cases had incomplete data and were excluded. 280 cases (38%) were tachycardic on arrival. Combined pre-hospital and in-hospital seizures were more common in patients with tachycardia 106/280 (38%, 95%CI 32-44%) than those without 10/458 (2.2%, 95%CI 1.1-4.0%), relative risk 17.3 (95%CI 9.2-32.6). Similarly, in-hospital seizures alone were more common in patients with tachycardia 59/280 (21%, 95%CI 16-26%) versus 8/458 (1.7%, 95%CI 0.8, 3.4%), relative risk 12.1 (95%CI 5.9-24.9). In two-year-olds initial heart rate did not correlate with drug dose/kg (Pearson correlation coefficient 0.04).

Conclusion: Patients with tachycardia on ED arrival had a higher total incidence of seizures and were at increased risk of in-hospital seizures. Children with tachycardia warrant observation after bupropion ingestion, while the absence of tachycardia may be reassuring. The reported drug dose ingested, however, does not appear to be a reliable predictor of heart rate in those 2 years of age, highlighting concerns about the accuracy of dose estimates reported to poison centers.

136 Rapid Cooling to 34°C is Not Associated with Improved Neurological Outcome Among Post-Cardiac Arrest Patients

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Background: Targeted temperature management has become a cornerstone of post-cardiac arrest care. Many centers continue to target 32 to 34C, yet little is known whether rapid cooling confers any outcome benefit.

Objectives: To investigate whether time from ED arrival to target temperature (34C) was associated with a good neurological outcome after out-of-hospital cardiac arrest (OHCA).

Methods: This retrospective review of our therapeutic hypothermia registry enrolled adult post-cardiac arrest patients brought directly to one of 3 cardiac resuscitation centers with independent, but similar post-arrest clinical pathways from November 2007 to June 2014. The primary outcome was time from ED arrival to target temperature of 34C divided into time intervals of 0-120, 120-240, and > 240 minutes. Good neurological outcome was defined as Pittsburgh cerebral performance category (CPC) 1-2 at hospital discharge.

Results: Of the 711 enrolled patients, 94% were out-of-hospital CAs, median age was 59 (IQR 49-68) years, median ROSC time was 20 minutes (IQR 14-28 minutes), and initial shockable cardiac rhythm was present in 54%. Survival to hospital discharge occurred in 306/711 (43%) and 274/711 (38%) had good neurologic outcome. For non-transfer OHCA patients with ED arrival time to target temperature 0-120 (n=76), 120-240 (n=162), > 240 minutes (n=197), there was an increase in good neurologic outcome with each time range of 27.6, 37.0, and 50.3%, respectively (p=0.001). A full logistic regression model controlling for the variables bystander CPR, shockable rhythm, witnessed arrest, and time from ED arrival to target temperature revealed the odds of a good neurologic outcome was 1.2 times (95% CI: 1.03-1.42) more likely for each 120 minute increase in ED arrival time to target temperature.

Conclusion: Faster cooling times were not associated with improved neurological outcome in our cohort of post-cardiac arrest patients. It is unclear if this association represents excessive pre-cooling brain injury or if the speed of cooling has limited clinical significance.

137 Efficacy of a Clinical Decision Unit in Avoiding 30-Day Hospital Readmission of Geriatric Patients

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Background: Under the Hospital Readmission Reduction Program, Medicare reduces payments to hospitals with excess readmission within 30 days of hospital discharge. Many ED providers place geriatric patients in Clinical Decision Units (CDU) within 30 days of hospital discharge in lieu of readmission, but there is no study that has yet determined the discharge to home rate of this patient population.

Objectives: This study aims to (1) determine the rate of readmission for geriatric patients (age ≥65) placed in observation within 30 days of previous inpatient discharge and (2) determine which geriatric diagnoses most frequently result in repeat ED visits or readmission to the hospital.

Methods: This is a retrospective chart review of patients meeting the following inclusion criteria: (1) age ≥65, (2) placed in the CDU of a single

urban ED between 08/22/2011 to 12/28/2013, and (3) discharged within the last 30 days from inpatient hospitalization at any of the affiliated healthcare system's 19 member hospitals. CDU data (diagnosis and disposition) was collected prospectively by CDU PAs and RNs. All inpatient data from 2011 to 2013 for the entire healthcare system was extracted retrospectively using a cost accounting analytics system to flag patients for inpatient stay at any of the participating hospitals in the 30 days prior to their CDU stay.

Results: 9,162 patients were included in the primary analysis, and of these, 150 patients met the inclusion criteria. Only 1 patient was readmitted from the CDU. 90 (60%) were discharged home, 57 (38%) were discharged to home health services, 5 (3.33%) were discharged to a skilled nursing facility, 1 (0.33%) was discharged to an inpatient rehabilitation facility, and 1 (0.33%) left against medical advice. There were 33 distinct CDU diagnoses recorded, with the most frequent being chest pain not otherwise specified (28; 18.67%), anemia (14; 9.33%), and dizziness not otherwise specified (6; 4%).

Conclusion: Geriatric patients placed in a CDU within 30 days of inpatient discharge demonstrated a low rate of readmission, and were successfully discharged for a wide variety of geriatric diagnosis. Future studies should investigate the factors that determine clinical decision making to admit geriatric patients to an inpatient unit or to the CDU.

138 Depression Screening for Older Adults in the Emergency Department

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Background: Older adults are at increased risk for developing depression, a disorder associated with functional decline and increased morbidity and mortality. Depression in older adults is often misdiagnosed and undertreated. Depression is not routinely screened for in the ED. As older adults comprise an increasing proportion of all ED patients, the ED may be a feasible setting for depression screenings in this at risk population.

Objectives: We evaluated the prevalence of depressive symptoms in older adults using the Patient Health Questionnaire (PHQ) at the initial ED presentation and at 8-weeks after the ED visit.

Methods: This was a prospective observational cohort study. From February 2012-June 2015, a convenience sample of English and Spanish-speaking patients ≥65 years old with capacity to consent were surveyed in the Mount Sinai Hospital ED. Depressive symptoms were measured using the validated PHQ 2/8 tool at initial in-person visits and telephone surveys at 8-weeks.

Results: A total of 2957 patients were surveyed in the ED and 74.3% (2197) completed 8-week follow-up. In the ED, 15.6% were found to have depressive symptoms (defined as a mild depression score or higher according to the PHQ key), with 11.7% experiencing moderate to severe symptoms. After 8 weeks, average PHQ 2/8 score improved by 0.38 (baseline average score: 2.34, SD 4.65). Of those without depressive symptoms in the ED, 90.9% remained asymptomatic at 8 weeks. However, of those with depressive symptoms, 34.0% continued to be symptomatic at 8 weeks. Of those with moderate to severe depressive symptoms in the ED, 40.8% continued to have some depressive symptoms and 32.2% continued to have moderate to severe symptoms. These results remain significant after adjusting for sex, race, lower socioeconomic status, lower level of education, functional status, admission status, and comorbidity.

Conclusion: As older adults constitute an increasing number of ED visits, depression screenings in the ED are feasible. Over 10% may have moderate to severe depressive symptoms, with more than 40% remaining symptomatic after 8 weeks. This setting may be an opportunity to improve screening in this population and reduce subsequently associated functional decline, morbidity, and mortality.

139 Screening and Referral for Depression in a New Senior Emergency Department: A Prospective Pilot Study of 6,317 Patients

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Background: Dedicated senior (geriatric) emergency departments (SEDs) are becoming more common in the US. These departments feature enhanced screening for common comorbidities in the elderly, and many screen for depression in seniors. It is critical to validate the selection of individual tests that are used in this screening. The value and importance of treatment for depression is widely accepted.

Objectives: The purpose of this study is to measure 1) the prevalence of depression with ED screening, and 2) among those who screen positive for active depression with a prior diagnosis of depression, what proportion are not being treated.

Methods: This is a prospective study conducted in the senior ED of a community hospital with an ED annual volume of approximately 48,000. The study included screening, consenting, interview and chart review of SED patients > 65 years of age. All patients were screened using the Yesavage/Stanford Geriatric Depression Scale (GDS, 5-point). Patients with a GDS of > 2 were assessed for prior diagnosis of depression and whether they are currently under treatment. Demographic features and insurance status were recorded. The study was approved by the IRB.

Results: A total of 6312 patients were screened using the Yesavage Geriatric Depression Scale (GDS, 5-point) from 9/14/2014 - 4/2/2015. Ninety-three patients screened positive for depression with a GDS of > 2. Of these, 63 patients consented for the study (65.6% female). Ages ranged from 66-93 years with median age of 80. These patients were then assessed for prior diagnosis of depression and whether they are currently under treatment. Forty-six patients (73.0%) had not been previously diagnosed with clinical depression and/or were not taking an antidepressant medication as determined by interview and chart review, and 1% stated they were unsure. Fifty-six patients out of 93 screen-positive patients (87.5%) received social work referral during their current visit.

Conclusion: This study found a low percentage of geriatric patients with depression. A test for a condition of very low prevalence is likely to have a higher false positive rate. The majority of the screen-positive depressive patients had not yet been treated, indicating potential benefit for referral of these patients.

140 ED Visits Without Hospitalization are Associated with Functional Decline in the Elderly

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Background: Disability and functional decline adversely affect the quality of life of older persons. Previous work has shown that illnesses and injuries leading to hospitalization have pronounced deleterious effects on functional status. Whether ED visits without hospitalization also result in adverse functional outcomes is not known.

Objectives: We sought to determine whether illnesses and injuries leading to an ED visit but not hospitalization are associated with functional decline among community-living older persons.

Methods: From a cohort of 754 community-living older persons who have been followed for 16+ years, we matched 829 ED visits without hospitalization to 829 observations without an ED visit or hospitalization. Participants (mean age: 85.7 y) were evaluated monthly for disability in 13 activities. We compared the course of disability over 6 months, using a 13-point scale, among 3 groups: those who had an ED visit but were not hospitalized (ED only), an age-, sex-, and disability-matched group who did not visit an ED (Control), and an unmatched group who were hospitalized (ED+Hosp). Disability scores were compared longitudinally using generalized linear models adjusted for age, sex, and other health and socioeconomic factors, which were assessed every 18 months.

Results: Baseline characteristics were well balanced between the 2 matched groups but were worse for the ED+Hosp group. The disability scores over 6 months are shown in the figure. In the longitudinal models, the ED only group had significantly higher disability scores than the control group, with an adjusted risk ratio [RR] of 1.15 (95%CI, 1.08-1.23). Among participants with an ED visit, those who were hospitalized had disability scores that were significantly higher than those who were not hospitalized, with RR of 1.18 (95%CI, 1.13-1.23). These differences between the 3 groups were observed across all 3 subtypes of disability (basic, instrumental and mobility).

Conclusion: Among community-living older persons, illnesses and injuries leading to an ED visit without hospitalization were associated with a clinically meaningful decline in functional status relative to a control group without an ED visit. This decline, although smaller than that associated with hospitalization, persisted over the course of 6 months.

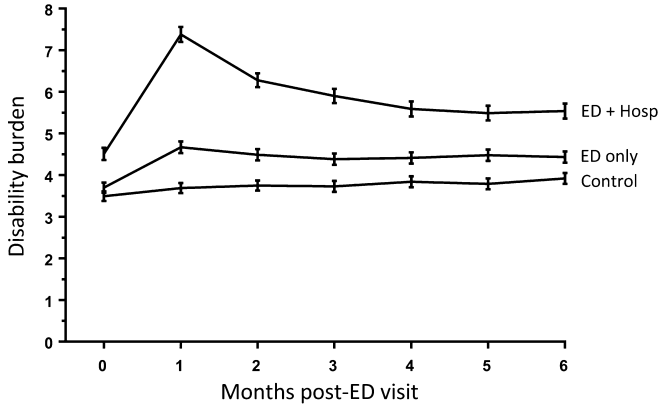

Figure 140 – Nagurney

141 Factors Associated with Hospital Admissions for Older Adults Receiving Care in United States Emergency Departments

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Background: Older (65 years and older) adults account for 20 million emergency department (ED) visits and 36% of all hospitalizations annually despite representing 13% of the United States (U.S.) population. Up to 25% of hospital admissions among older adults may not be clinically indicated. However, data on factors other than illness acuity that influence the decision to hospitalize an older adult once he or she has presented to an ED is limited.

Objectives: To determine the role of age and other visit characteristics in hospital admissions among older adults.

Methods: We examined the relationship between ED visit characteristics and hospital admissions among older adults receiving care in US EDs using National Hospital Ambulatory Medical Care Survey data from 2001-2010, using multivariable models and Poisson regression equations. Admissions to critical care or higher acuity settings (ICU, stepdown/telemetry) were excluded in order to minimize unavoidable hospitalizations.

Results: There were an estimated 175 million ED visits by older adults between 2001 and 2010. Overall, 38% of visits resulted in a hospital admission, with 32.5% admitted to non-ICU settings. The proportion admitted to non-critical care settings was independently associated with increasing age (RR 1.16 per 10 year increase in age, p<0.001), was higher in whites than blacks (RR 1.13, p<0.001), at urban EDs (RR 1.4, p<0.001), at teaching hospitals (RR 1.3, p<0.001), at EDs in the Northeast or Midwest (RR 1.3, p<0.001) and among patients with greater clinical acuity (RR=2.5, p<0.001), after adjusting for sociodemographic, clinical and institutional confounders associated with hospitalization.

Conclusion: Adults 65 years and older seeking care in U.S. EDs experience a higher likelihood of hospital admission with increasing age. The likelihood of hospital admission was also influenced by race and the teaching status, regional location and rurality of the ED. These observed associations were independent of relevant clinical, institutional and sociodemographic characteristics identified at ED visits. Further population-based research is needed to better understand reasons for hospitalization in this patient population in order to reduce potentially avoidable hospitalizations in older adults.

142 Predictors of Successful Telephone Follow-Up After an ED Visit and Implications for Geriatrics Research and Clinical Reassessment

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Background: Researchers and clinicians rely upon telephone follow-up as a means of data collection and patient reassessment after the emergency department (ED) visit. A previous study on telephone follow-up after an ED visit reported significantly lower follow-up rates for patients without cell phones.

Objectives: Given lower rates of cell phone use among geriatric patients, we evaluated the utility of telephone follow-up in the ED geriatric population.

Methods: We performed a secondary analysis of prospectively collected data for patients presenting to an urban, academic ED with chest pain. We informed patients that we would be contacting them by telephone and asked them to provide a phone number. We attempted to contact patients at least 30 days after the ED visit. We made at least eight attempts at telephone contact at various times of the day. The primary outcome measure was successful telephone contact that resulted in obtaining pre-defined clinical follow-up information.

Results: Over the 42-month study period, 1990 patients agreed to participate in the study. Average patient age was 49.9 years (range: 18-104 years); 54.8% of patients were female and 19.2% were geriatric (age 65 or older). The overall 30-day telephone follow-up rate was 66.4%. Successful follow-up was more likely among geriatric patients compared to non-geriatric patients (75.1% vs. 64.3%, p<0.001). Among geriatric patients, we were more likely to contact females than males (80.1% vs. 68.7%, p=0.010). Telephone follow-up rates were not significantly different between age groups 65-74 years and those 75 years and older (77.8% vs. 70.1%, p=0.098). Similarly, we did not find a significant difference in follow-up rates among geriatric patients based on ED disposition (discharge, 70.7%; observation, 79.3%; inpatient admission, 73.2%; p=0.284).

Conclusion: Despite concerns for decreased follow-up for older patients, we noted high 30-day telephone follow-up rates among geriatric patients after an ED visit. Our findings have implications for both emergency geriatrics research and clinical follow-up.

143 Concentration of ED Utilization Among Medicare Beneficiaries

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Background: Reducing unnecessary healthcare spending is a major policy priority and ED utilization is frequently cited as an area of focus by policymakers. One approach has been to focus on "high utilizers" (HUs) - the small number of people who use a large proportion of healthcare services. The degree to which ED use is "concentrated" among a small number of Medicare beneficiaries is unclear.

Objectives: We sought to characterize the concentration of ED utilization among Medicare beneficiaries and understand the differences between "high utilizers" and others.

Methods: We identified all ED visits among Medicare beneficiaries to acute-care hospitals in the U.S. in 2013 using research identifiable files. We excluded beneficiaries under age 65. We defined HUs as those with 3 or more ED visits in a year, as this identified the top 5% of beneficiaries in our sample. We compared HUs and non-HUs on demographics, prevalence of chronic conditions, mean number of ED visits, and admission rate.

Results: There were 5,605,362 beneficiaries in our sample with 2,650,624 ED visits, a mean of 0.5 visits per beneficiary. 271,201 individuals (4.8% of all beneficiaries) were defined as HUs a mean of 4.2 ED visits, accounting for 43.3% percent of ED visits in our sample. Non-HUs had a mean of 0.3 visits per beneficiary. HUs were older, less often men, slightly more often black, and more often were eligible for Medicaid (26% vs 12%) (see Table 1). They had substantially more comorbidities. They were more likely to be admitted (39.3% vs. 35.7%; p<0.0001).

Table 1. Characteristics of High Utilizer Beneficiaries versus Non-High Utilizers

		High Utilizers	Non-high Utilizers	All Beneficiaries
N		271,201	5,334,161	5,605,362
Mean ED visits		4.0	0.3	0.5
Admission Rate		39.3%	35.7%	37.3%
Mean Age (years)*		79.5	75.3	75.5
Male*		39.1%	44.0%	43.5%
Medicaid eligible*		26%	12%	13%
Race*	White	83.4%	86.3%	86.2%
	Black	11.8%	7.4%	7.6%
	Hispanic	2.0%	1.6%	1.6%
	Asian	1.2%	1.8%	1.8%
	Other			
*Mean Number Comorbidities (HCCs)**		6.4	1.7	2.0
Congestive Heart Failure		52%	12%	14%
Specified Heart Arrhythmias		47%	15%	16%
Renal Failure		46%	12%	14%
COPD		47%	14%	15%
Vascular Disease		39%	15%	16%

*Chi square analysis demonstrates significant difference between high utilizers and non-high utilizers at p<0.0001

**HCCs refers to Center for Medicare and Medicaid Services Hierarchical Condition Categories

Conclusion: The vast majority of HU Medicare beneficiaries had no or 1 ED visit in 2013. Given that HUs had a much high burden of poverty and chronic illness and more often required admission, these findings suggest that their high utilization may reflect their greater medical need, not necessarily overuse of ED care, at least in the Medicare population.

144 The Increased Likelihood of 30-Day Emergency Department Revisit and Hospital Readmission Among Homeless Patients with Mental Health Conditions

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Background: Patients with mental health conditions frequently use emergency medical services. Many suffer from substance use and homelessness. If they utilize the ED as their primary source of care, potentially preventable frequent ED revisits and hospital readmissions can worsen an already over-crowded health care system. However, the magnitude to which homelessness affects health service utilization among patients with mental health conditions remains unclear in the medical community.

Objectives: Assess the impact of homelessness on 30-day ED revisits and hospital readmissions among mental health patients in an urban, safety-net hospital.

Methods: Retrospective chart review abstracted all adults ED visits in 2012 from LAC+USC Medical Center, Los Angeles. Patient demographics, mental health status, homelessness, insurance coverage, level of acuity, and ED disposition per ED visit were analyzed using multilevel modeling approach to control for multiple visits nested within patients. Multivariate logistic regressions were performed to evaluate if homelessness moderated the likelihood of mental health patients' 30-day ED revisits and hospital readmissions.

Results: Study included 139,414 adult ED visits from 92,307 unique patients (43±15 years, 51% male, 68% Hispanic/Latino). Eight percent of patients met the definition of having a mental health condition (12% of total visits), while 5% of patients were homeless at any time during the study period. Being homeless significantly increased the likelihood of 30-day ED revisits (OR: 5.48, 95% CI: 4.85-6.18, p<0.001) and hospital readmissions (OR: 2.82, 95% CI: 2.31-3.46, p<0.001) among patients with mental health conditions compared to non-homeless, non-mental health (NHNM) patients. Adjusted predicted probabilities showed that homeless patients with mental health conditions have a 31% chance returning to the ED within 30-day post discharge and a 4% chance of hospital readmissions, compared to non-homeless patients with mental health conditions (25%, 3%) and NHNM (8%, 2%).

Conclusion: Homeless patients with mental health conditions were more likely to return to the ED within 30 days and to be readmitted to the hospital. Interventions providing housing, social services, and primary care might improve their overall care management and has the potential to reduce ED revisits and hospital readmissions.

145 Primary Care Access for Medicaid Patients with Depression in the Emergency Department

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Background: Primary care is an adequate setting to address mental health needs. However, certain populations, such as Medicaid patients,

do not have easy access to primary care providers (PCP) and use the ED to address chronic health conditions.

Objectives: To assess depression in Medicaid patients in the ED using the Patient Health Questionnaire (PHQ-9) and their subsequent access to primary care.

Methods: We conducted a cross-sectional quality improvement study of non-pregnant, Medicaid patients aged ≥18 years who presented to the ED with a non-mental health complaint. Patient navigators conducted health screenings on Medicaid patients in the ED 7 days a week from November 2014 to February 2015 and covered all hours of ED operations in the following sequence: 2 mornings (7AM-3PM), 2 evenings (3PM-11PM) and 1 night (11PM-7AM). We collected information on current medical and mental health conditions and conducted depression screening, using the PHQ-9. We determined the number of patients who were not previously diagnosed with depression, but screened positive for depression (score ≥ 5; criteria needed for follow up and possible treatment) and further evaluated their access to primary care services. We analyzed our data using a confidence interval for proportions.

Results: Of the 837 Medicaid patients approached, 661 patients (79.0%) agreed to complete the health screening form; 5 (0.8%) were omitted secondary to incomplete surveys. The average age was 36.7 years, and the population was 34.4% White, 23.4% Hispanic, 37.0% Black, and 2.3% Asian/Pacific Islander (Table 1). In total, 30.3% (95% CI 27.0%-34.0%) reported having a diagnosis of depression and 33.1% (95% CI 29.5%-36.7%) reported no PCP. Of the 456 patients who did not report having depression, 21.5% (95% CI 17.7%-25.3%) screened positive using the PHQ-9 (score ≥5). 16.8% (95% CI11.1%-22.4%) of patients with undiagnosed depression did not have a PCP. The difference in depression scores between those with and without a PCP is shown in Graph 1.

Conclusion: One in 5 Medicaid patients who use the ED have undiagnosed depression requiring follow up and/or treatment initiation. Approximately 17% of these patients do not have a PCP. Conducting depression screenings in the ED may help identify patients who need immediate follow up and treatment for depression in the outpatient setting.

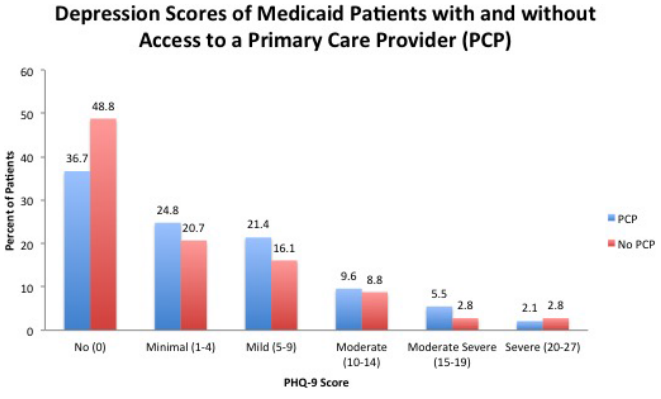

Figure 145 – Bergamo

Patient Characteristic	Study Population (N=656)
Age (years), n±sd	36.7±11.7
Race, n (%)	
White	222 (34.4)
Hispanic	151 (23.4)
Black	239 (37.0)
Asian/Pacific Islander	15 (2.3)
Other	19 (2.9)
Reported Depression, n (%)	200 (30.3)

Table 145: Bergamo.

146 Barriers and Service for Frequent Emergency Department Users

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Background: Frequent emergency department (ED) users make four or more ED visits in a year. Frequent ED users are high-resource utilizers. This study provided a better understanding to serve this population.

Objectives: This study aimed to understand why frequent ED users present to the ED, what barriers to care exist, and what services may be helpful to these patients.

Methods: We performed a prospective study of frequent ED users in an urban level 1 trauma center with an annual census of 120,000 visits. Participants were administered a piloted and pretested structured interview by a trained researcher querying demographics, ED usage, perceived barriers to care, and potential aids to maintaining health.

Results: Of 1,523 screened patients, 297 were frequent ED users. One-hundred ninety seven (197) frequent ED users were excluded or declined study participation and 100 were enrolled. The mean age was 48 years (95% confidence interval (CI) 45-51). The majority of subjects were female (64%, 64/100, CI 55-73%), white (61%, 60/98, CI 52-71%) and insured by Medicaid (55%, 47/86, CI 44-65%), Medicare (23%, 20/86, CI 14-32%), or both (9%, 8/86, CI 3-15%). On average, the subjects had 8 ED visits, 2 admissions, and 1 observation visit in the past year. Most frequent ED users (61%, 59/96, CI 52-71%) stated the primary reason for their visit was that they felt that their health problem could only be treated in an ED. Taking time away from work or family commitments to receive health care and remembering to schedule annual preventative care were the most commonly cited barriers to care (15% (14/96, CI 8-22%) and 16% (15/96, CI 8-23%), respectively). Subjects stated that "after-hours options, besides the ED for minor health issues" (63%, 60/95, CI 53-73%) and having "a nurse to work with you one-on-one to help manage health care needs" (53%, 50/95, CI 43-63%) would be most helpful.

Conclusion: This survey identified several opportunities to better serve frequent ED users and thus potentially reduce overall health care costs. By understanding barriers to care from the frequent ED user perspective, health systems may address unmet needs that prevent wellness in this population.

147 Health Literacy and Patient Activation in an Urban Emergency Department

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Background: The patient activation measure (PAM) is a validated tool used to assess knowledge, skills, and confidence as they relate to health care self-management. Both PAM and health literacy, another measure of a patients' ability to function in the health care system, have been associated with outcomes for a number of disease states, yet little research has explored the relationship between these two parameters.

Objectives: The objective of this study was to test the hypothesis that health literacy and patient activation are positively correlated in a population of urban ED patients.

Methods: This is a single center, observational cohort study utilizing a convenience sample of 91 patients presenting to the ED. Health literacy was assessed with a single, previously-validated survey item: "How confident are you filling out medical forms yourself?" PAM scores and corresponding activation levels were calculated based on participant responses to 13 survey items. Basic demographic information was also collected. Goodman and Kruskal's gamma statistic was used to test the study hypothesis.

Results: Among 91 respondents, the median age was 42 (IQR 26 to 54), 50.6% were female, and 89.0% were African American. 62.6% of these patients had Medicaid for their primary insurance, while 22.0% were privately insured. 83.5% of patients reported yearly household incomes below $25,000. The Table depicts baseline characteristics, health literacy, and PAM levels for study participants. 42.8% showed little to no confidence in filling out medical forms indicating poor health literacy, and 46.1% had lower levels (1, 2, or 3) of activation. Goodman

Table: Health Literacy and Patient Activation in an Urban ED

Age, Years (median [IQR])	42 [26 to 54]
Female (n [%])	46 [50.6%]
African American (n [%])	81 [89.0%]
Reported ED Visits Past Year (mean [IQR])	3 [2 to 5]
Insurance Status (n [%])	
Private	20 [22.0%]
Medicare	5 [5.5%]
Medicaid	57 [62.6%]
No insurance	9 [9.9%]
Income (n [%])	
$0 - $25,000	76 [83.5%]
$25,000 - $50,000	11 [12.1%]
Relationships with Primary Care (n [%])	
See Regularly	25 [27.5%]
See Rarely	29 [31.9%]
Don't Currently Have One	17 [18.7%]
PAM (n [%])	
LEVEL 1: May not yet believe that patient role is important	14 [15.4%]
LEVEL 2: Lacks confidence and knowledge to take action	12 [13.2%]
LEVEL 3: Beginning to take action	16 [17.6%]
LEVEL 4: Has difficulty maintaining behaviors over time	49 [53.9%]
Confidence Filling Out Medical Forms (n [%])	
Not at all	4 [4.4%]
A little	7 [7.7%]
Somewhat	28 [30.8%]
Very	30 [33.0%]
Extremely	22 [24.2%]
n	91

HFU = high frequency user, IQR = interquartile range, CI = confidence interval

Table 147: Janke.

and Kruskal's gamma statistic was 0.5339 (p=0.0307), demonstrating a statistically significant positive correlation between health literacy and PAM level.

Conclusion: In a prospective survey of 91 patients at a large, urban ED, health literacy and patient activation were partially correlated, but significant independent variation remained. Clarifying the significance of this variation would help inform future research aimed at improving health outcomes through interventions targeting poor health literacy and low patient activation.

148 Patient Activation Among Frequent Users of the Emergency Department

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Background: Frequent users of the emergency department (ED) place a heavy burden on the healthcare system. One contributing factor may be patient activation, a composite term representing the confluence of skills, opinions, and motivations as they relate to health care self-management. The patient activation measure (PAM) is a 13-item survey developed to provide a reliable measure of activation.

Objectives: The objective of this study was to test the hypothesis that high frequency ED users have lower activation levels than other ED users.

Methods: This is a single center, prospective observational cohort study utilizing a convenience sample of 91 patients presenting to the ED. The PAM is a validated tool that segments patients into four

Table: Summary Statistics by High Frequency User (HFU) Status

	Non-HFUs (n=48)	HFUs (n=43)
Age, Years (median [IQR])	38 [25 to 48]	46 [28 to 62]
Female (n [%])	24 [50.0%]	22 [45.8%]
African American (n [%])	43 [89.6%]	38 [88.4%]
Reported ED Visits Past Year (mean [IQR])	2 [1 to 2]	5 [5 to 8]
Insurance Status (n [%])		
Private	10 [20.8%]	10 [23.3%]
Medicare	2 [4.2%]	3 [7.0%]
Medicaid	31 [64.6%]	26 [60.5%]
No insurance	5 [10.4%]	4 [9.4%]
Income (n [%])		
$0 - $25,000	37 [77.1%]	39 [90.7%]
$25,000 - $50,000	8 [16.7%]	3 [7.0%]
Relationships with Primary Care (n [%])		
See Regularly	14 [29.2%]	11 [25.6%]
See Rarely	18 [37.5%]	11 [25.6%]
Don't Currently Have One	10 [20.8%]	7 [16.3%]
PAM (n [%])		
LEVEL 1: May not yet believe that patient role is important	7 [14.6%]	7 [16.3%]
LEVEL 2: Lacks confidence and knowledge to take action	6 [12.5%]	6 [14.0%]
LEVEL 3: Beginning to take action	6 [12.5%]	10 [23.3%]
LEVEL 4: Has difficulty maintaining behaviors over time	29 [60.4%]	20 [46.5%]

HFU = high frequency user, IQR = interquartile range, CI = confidence interval

Table 148: Bedford.

distinct activation levels based on their responses to a 13-item survey. PAM scores and basic demographic information were collected from participants along with ED use patterns. Patients were defined as high frequency users if they reported four or more ED visits in the preceding year. Goodman and Kruskal's gamma statistic was used to test the study hypothesis.

Results: Among 91 respondents, the median age was 42 (IQR 26 to 54), 50.6% were female, and 89.0% were African American. 62.6% of these patients had Medicaid for their primary insurance, and another 22.0% were privately insured. 83.5% of these patients reported yearly household incomes below $25,000. 43.7% of participants were high frequency ED users. The Table compares baseline characteristics and activation levels for high frequency users with those who had lower frequency ED use. There were no statistically significant differences in baseline characteristics between populations. Goodman and Kruskal's gamma statistic was -0.1755 (p=0.2483), demonstrating no significant correlation between having high-frequency ED use and activation level as derived using the PAM.

Conclusion: In a survey of 91 patients at a large, urban ED, no correlation was found between frequent ED use and patient activation level. Much unexplained variation remains in the likelihood of frequent ED use and additional research exploring patient activation may yet inform ED-based interventions to improve healthcare utilization among different populations.

149 Emergency Medicine Milestones: Longitudinal Agreement Between Faculty Assessment and Resident Self-Evaluation

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Background: The EM milestones were developed by EM experts for the Accreditation Council for Graduate Medical Education, to recurrently assess competency-based developmental outcomes of postgraduate trainees. Little is known regarding how closely resident self-evaluations compare to faculty evaluations using the milestones tool.

Objectives: To determine whether resident self-evaluation scores were consistent with their corresponding faculty evaluation scores in the semiannual EM milestones assessments.

Methods: We collected milestone scores of postgraduate year (PGY-1 to PGY-4) EM residents training at one urban, academic medical center from spring 2014, fall 2014, and spring 2015. We then matched residents' self-evaluation scores to their corresponding faculty evaluation scores (determined by the program Core Competency Committee). For each of the 23 milestones at each time point, we calculated Cohen's quadratically-weighted kappa statistical values (95% CI) to assess the degree of chance-corrected association between the self-evaluations and faculty evaluations.

Results: We found a weighted kappa range of 0.43 - 0.88, 0.39 - 0.87, and 0.59 - 0.85 for spring 2014, fall 2014, and spring 2015, respectively, indicating moderate to strong chance-corrected association for nearly all milestone assessments at each time point. The milestone assessing competence with vascular access (PC14) in spring 2014 had the highest chance-corrected association with a weighted kappa value of 0.88 (95% CI 0.81 - 0.94), indicating almost perfect chance-corrected association. The milestone assessing accountability (PROF2) in fall 2014 had the lowest chance-corrected association (0.39, 95% CI 0.04 - 0.74). Sample sizes for each self-assessed milestone ranged from 32 to 45 responses.

Conclusion: Our results demonstrate that residents' self-evaluation of their own competency-based development as defined by the milestones assessment tool is, on average, in alignment with their corresponding faculty evaluations. Further time points and data are needed to examine postgraduate year trends.

150 Educational Innovation—Application of the Flipped Classroom to Pediatric Education in Emergency Medicine Residency Curriculum

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Background: The flipped classroom reverses traditional lecture and homework elements in which learning materials are given in advance and allowing class time for active learning exercises. This educational approach is theorized to improve learner engagement, retention and allows for more complex learning during class.

Objectives: 1. Condense core Pediatric Emergency Medicine (PEM) curriculum to online lectures; 2. Utilize class time for interactive sessions; 3. Assess resident satisfaction via Likert scale; 4. Record completion rate of preparatory materials

Methods: Twelve approximately 10-minute lectures highlighting topics from the APLS course were filmed and integrated with an online service Zaption (www.zaption.com). Questions were integrated into the lectures to reinforce concepts. Explanations to incorrect question responses were given in real time. One half of residents were randomized to view online lectures with integrated questions (3 per 10 minute lecture) and the remainder viewed the lectures uninterrupted. The residents were expected to view the lectures prior to an in-class session (total viewing time approximately 2 ½ hours). The 2 hour in-class session included 4 simulation and 3 procedure stations with 6 PEM faculty available for higher level management discussion throughout the stations. A pre-test and post-test was given to assess learning and survey administered to evaluate resident satisfaction with educational experience. The video log of number and length of views was recorded in 2015.

Year	Pre-test score	Post-test score	
2014	N=16	A (n=8)	B (n=9)
	55% (42-63)	**89%** (79-100%)	**87%** (58-96%)
2015	N=16	A (n=9)	B (n=8)
	71% (54-88)	**75%** (58-83%)	**87%** (79-96%)

Figure 150 – Rose

Results: In both years, residents demonstrated improved performance on the post-test (Table 1). When asked on a Likert scale, all residents strongly preferred online lectures to live lectures and the majority preferred interactive questions within the online lectures. The residents were asked anonymously to report the percentage of lectures viewed. In both years, 14/17 reported viewing all of the lectures. In 2015 the video log was reviewed and notably only one resident actually viewed all of the lectures.

Conclusion: Test scores improved and resident satisfaction was high with this educational innovation. However, completion rates may need to be monitored for successful implementation.

151 Resident Education in 2015: National Trends in Clinical Rotation Curricula Among ACGME Accredited Emergency Medicine Residency Programs

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Background: Emergency medicine (EM) residency programs are tasked with preparing new EM physicians for board certification and independent practice. To date, no study has described how ACGME accredited EM residency programs structure their training.

Objectives: To describe the rotation curricula of ACGME accredited EM residency programs in 2015.

Methods: The 2015 list of ACGME accredited EM residency programs provided the study sample. Data including required rotation types and durations were obtained from publicly available program websites from September to November of 2015. Two second-year EM residents coded the data independently. All coding decisions were documented and reviewed by the entire team to achieve consensus. Descriptive statistics were used to assess the range of required rotation types, amount and percentage of time spent in various clinical settings, and percentage of programs offering each rotation type.

Results: The sample included 168 EM residency programs. Among the 164 with complete data, 82 unique required rotation experiences were described. 67.5% of programs use 4-week blocks to measure rotation duration with the remainder utilizing month-long blocks. 45 rotations were present at <10% of programs. "Core" rotations, defined as those present at >79% of programs, were: Anesthesia, EM, Elective, Medical Intensive Care Unit (ICU), Obstetrics, Pediatric EM, Pediatric ICU, Trauma, and Ultrasound. Overall, EM residents spend an average of 63.0% of their residency training in the emergency department (ED), 11.2% in an ICU, 4.2% on dedicated trauma rotations and 5.1% on electives/selectives. 80 programs (48.8%) specifically described integrating pediatric EM shifts into EM months. When examined independently, 4-year EM residencies were found to spend twice as much time on elective rotations (4-year median 4.0 blocks, national median 2.0 blocks). 4-year programs also spend more time in the ED (4-year median 30.0 blocks, national median 24.25 blocks) and in the ICU (4-year median 5.0 blocks, national median 4.0 blocks).

Conclusion: This study describes the considerable variation that exists across the rotational curricula of ACGME accredited EM residency programs. Future work comparing program curricula to outcomes data such as board pass rates or post-residency assessments of training may help establish best practices for EM graduate medical education.

152 Assessing Resident Error in the Emergency Department

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Background: The incidence and categorization of errors and adverse events in emergency medicine among residents is an understudied field of research.

Objectives: To determine and compare rates and types of error and adverse events among residents and attendings in an academic ED.

Methods: Prospective data were collected on patients presenting between 9/12-3/15 to a tertiary-care ED, census 56,000 patients/year. Cases meeting predetermined criteria were identified by an electronic medical record. Criteria for review included patients returning to the ED <72 hours and then admitted, admissions from the ED to the floor and then transferred to ICU <24 hours, death <24 hours from ED arrival, or referrals to ED administration due to physician/patient complaints. Cases were randomly assigned to trained physicians not involved in care and using a structured electronic tool to assess occurrence of error and adverse events then referred to a 20 participant committee for final arbitration. Errors were categorized as delays in diagnoses, incorrect/inadequate treatment, incorrect/inadequate medication dosing, testing error (no test done or test misinterpreted) and documentation error. Statistics included point estimates, 95% CI and Fisher's exact test for comparison.

Results: Of 5773 cases screened by individual reviewers 2381 (41%) met criteria for final arbitration. Ninety errors were identified, 38 (42%) involved residents and 51 (58%) were attributed to attendings without resident error. Of 24 adverse events identified, 11 involved residents and 13 involved attendings without resident error. Among residents, 8/38 (21%:0.13-0.41) errors were delays in diagnoses compared to 33/89 (37%:0.28-0.47) attendings [p<0.01], treatment errors- 8/38 (21%:0.11-0.36) vs. 22/89 (11%:0.17-0.35) [p=0.821], medication errors- 12/38 (32%:0.19-0.48) vs. 12/89 (13%:0.08-0.22)[p<0.05], testing errors- 7/38 (18%:0.09-0.33) vs. 17/89 (19%:0.12-0.28)[p=1.0] and documentation errors-3/38 (8%0.02-0.21) vs. 4/89 (4%:0.02-0.11)[p=0.70].

Conclusion: Although residents are less likely than attendings to make errors in a controlled training setting, they are relatively more likely to have adverse results from their errors. In particular, residents are less likely to make delay in diagnosis errors and more likely to make medication errors.

153 Impact of EMR Discharge Notifications on Rates of Patient Follow-Up and Treatment of Hypertension: A Retrospective Cohort

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Background : The dangers of untreated hypertension (HTN) are well known. Because of this, recognition of abnormal elevated blood pressure (EBP) during ED encounters is very important. We implemented an EMR alert which generates a notification to providers at the time of discharge if a patient's blood pressure has exceeded 140/90 during their visit. The alert also prompts the clinician to provide the patient with a diagnosis of EBP or HTN, a primary care referral, and/or HTN specific discharge instructions.

Objectives: We sought to determine if the alert led to improved patient notification of EBP and ultimately to improved primary care referral and follow-up.

Methods: We conducted a retrospective chart review of 1001 charts (501 pre- and 500 post-intervention) at a tertiary care teaching hospital with annual census of 81,000. Data was abstracted from the electronic medical record by two trained researchers.

Results: 40 (8.0%) patients in the pre-intervention group and 82 (16.4%) patients in the post-intervention group received either a new HTN diagnosis, a referral to primary care for blood pressure follow up, or discharge instructions regarding HTN (p<0.0001). A greater difference was seen among patients with no history of HTN (4.2% pre- and 18.3% post-intervention; p<0.0001). When limited to patients with at least two EBPs during the ED visit, the difference was more pronounced (7.0% pre- and 27.4% post-intervention; p<0.0001). Following the ED visit, an equal number of pre- and post-intervention patients were seen in follow up within the next 3 months (54% vs 55%). Of those, only 29 patients (5.8%) in the pre-intervention group had a new antihypertensive or changes to their antihypertensive medications versus 54 patients (10.8%) in the post-intervention group (p<0.005).

Conclusion: After the EMR alert was implemented, a greater proportion of patients received a key intervention (a new HTN diagnosis, a referral to primary care for follow up, or discharge instructions regarding HTN). This was most pronounced in groups with no prior history of HTN and patients with repeatedly elevated blood pressures during their ED visit. This intervention correlated with an increase in the number of patients who had adjustments to their antihypertensive regimens in follow up.

154 Relationship Between Feedback Behavior and Faculty Rank

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Background: Faculty provision of performance feedback is critical for residents to improve their clinical skills. The faculty-resident relationship is an important factor influencing feedback behavior, and fear regarding its damage is a frequently cited obstacle to delivery of corrective feedback. No previous studies have examined the extent to which feedback behavior influences resident rating of faculty.

Objectives: To determine whether faculty feedback behavior is associated with resident rating of faculty.

Methods: We performed a cross-sectional study at a 4-year EM residency program examining the relationship between feedback behavior and faculty rating, using resident-assigned Likert-scale measurements from our annual "Resident Evaluation of Faculty" evaluation. Descriptive statistics were used to summarize the data. Linear regression was used to measure the association between feedback delivery behavior and resident rating of faculty.

Results: 948 evaluations of faculty submitted for academic year 2015-2016 were analyzed. The majority of evaluated faculty were male (65.9%, 95%CI 62.8-28.8) and in the 40-49 year age range (38.7%, 95% CI 35.6-41.8). When evaluated on whether they provide direct feedback, and how they compare with other clinical teachers, the mean scores were 3.02 (95%CI 2.97-3.1) (Likert scale 1-4), and 4.05 (95%CI 3.9-4.1)

Tichter Table 1: Linear Regression Model for Faculty Rating

	Beta- coefficient	95% CI
AGE		
30-39	reference	-
40-49	-0.06	-0.13 – 0.01
50-59*	-0.11	-0.18 to -0.33
60-69	0.09	-0.52 – 0.70
SEX		
male	reference	-
female*	-0.09	-0.15 to -0.03
CLINICAL VARIABLES		
knowledge of EM*	0.12	0.06 – 0.17
sensitive to residents*	0.14	0.08 – 0.20
available to residents*	0.21	0.15 – 0.27
teaching & enthusiasm	0.03	-0.03 – 0.09
patient care & bedside skills*	0.13	0.06 – 0.12
bedside supervision*	0.06	0.00 – 0.11
punctuality	-0.01	-0.03 – 0.01
communication*	0.27	0.22 – 0.32
promotes reflection*	0.10	0.08 – 0.13
provides feedback	0.02	-0.02 – 0.06

*p<0.05

(Likert scale 0-5), respectively. In the multivariable model, feedback behavior had no association with faculty rating, after adjusting for age, sex, and clinical performance variables (see Table 1).

Conclusion: Feedback behavior is not significantly associated with overall rating of faculty members by residents. Faculty should provide context-specific, critical performance feedback to residents without fear of damaging the faculty-resident relationship.

155 Inter-observer Agreement in Pediatric Cervical Spine Injury (CSI) Risk Assessment Between Emergency Medical Services (EMS) and Emergency Department (ED) Providers

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Background: Current CSI decision support tools have been derived from physician observations. There is a need to demonstrate that prehospital EMS providers can reliably assess children for CSI risk during triage as they perform spinal precautions and field disposition decision-making.

Objectives: To determine the inter-observer agreement between EMS and ED providers in the assessment of pediatric CSI risk factors after blunt trauma.

Figure 1 Inter-observer agreement between EMS and ED providers CSI risk factors

CSI Risk Factors	Prevalence of finding per ED physician (%)	K	95% CI
Mechanism of Injury/Biomechanics			
High risk MVC*#	6.4	0.5	0.43-0.61
Diving injury#	0.5	1.0	1.0-1.0
Axial load	5.5	0.25	0.16-0.35
Clothes-lining	1.1	0.28	0.06-0.50
History			
Predisposing conditions#	0.3	0.09	-0.08-0.28
Loss of consciousness	21.5	0.60	0.54-0.66
Neck pain#	35.8	0.51	0.46-0.57
Inability to move neck#	4.5	0.21	0.09-0.33
Paresthesias	5.5	0.38	0.28-0.49
Numbness	4.6	0.36	0.27-0.46
Weakness	3.3	0.21	0.12-0.30
Physical Exam			
Altered mental status#	15.2	0.5	0.44-0.56
Signs of substantial head injury other than altered mental status	3.3	0.18	0.07-0.29
Posterior midline tenderness to palpation	33.3	0.37	0.31-0.43
Limited neck range of motion#	4.6	0.36	0.21-0.50
Substantial torso injury#	4.7	0.29	0.18-0.40
Substantial thoracic injury	1.1	0.25	0.07-0.44
Substantial abdominal injury	3.2	0.26	0.12-0.40
Substantial pelvic injury	0.9	0.36	0.10-0.62
Thoracic spine tenderness	23.5	0.38	0.31-0.44
Lumbar spine tenderness	14.7	0.38	0.30-0.46
Sacral spine tenderness	5.0	0.13	0.02-0.23
Focal neurologic deficits#	3.12	0.22	0.10-0.34
Paresthesias	1.4	0.12	-0.02-0.25
Decreased sensation	1.7	0.22	0.06-0.38
Weakness	2.2	0.25	0.10-0.40

*Intrusion, including roof: >12 inches occupant site, > 18 inches any site; Ejection (partial or complete) from automobile; Death in same passenger compartment; Vehicle telemetry data consistent with a high risk of injury
#Independent risk factor from PECARN model of CSI risk in children after blunt trauma

Table 155: Browne.

Methods: We prospectively enrolled children <18 years with blunt trauma at risk for CSI transported by EMS providers to one of four participating pediatric EDs. Data collection included independent clinical assessment by both EMS and ED providers regarding variables pertinent to CSI risk including mechanism of injury, patient history, and physical examination findings. Using kappa (κ) analysis, each variable was assessed for inter-observer agreement between EMS and ED provider. Variables with a lower 95% confidence level of $\kappa \geq 0.4$ were considered to have acceptable agreement.

Results: 1225 pairs of EMS provider-ED provider observations were obtained on 26 candidate variables. Acceptable agreement was achieved in 5 (19%) of the risk factors: 2 of 4 mechanisms of injury (50%), 2 of 7 historical elements (29%), and 1 of 15 physical findings (7%). Of the 9 risk factors previously found to be independently associated with CSI risk by the Pediatric Emergency Care Applied Research Network, EMS and ED providers demonstrated acceptable agreement for 4 of 9 and poor agreement for 5 of 9.

Conclusion: EMS and ED providers showed poor agreement for the majority of CSI risk factors. Our results support the need to develop a pediatric CSI risk assessment tool specifically for use in the prehospital setting and to include EMS providers in its development.

156 Emergency Medical Services (EMS) Providers' Beliefs Regarding Spinal Precautions for Pediatric Trauma Transport

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Background: Investigators previously demonstrated practice variability in the use of spinal precautions for children.

Objectives: To describe EMS providers' beliefs regarding spinal precautions for pediatric trauma transport.

Methods: We surveyed randomly selected NREMT providers regarding spinal precautions for pediatric trauma transport. We assessed their beliefs about 1) specific precautions and 2) most appropriate precautions given a child's age (0-4 and 5-18 years) and presence of specific cervical spine injury (CSI) risk factors. The survey was cognitively tested before being electronically administered. Descriptive statistics were calculated.

Results: We received 5400 responses (17%). Most were paramedics (34%) or EMTs (23%) and worked at fire-based services (42%) and in urban areas (59%). Few (12%) responded to > 1 pediatric call per week. Consensus beliefs (> 66% agreement) were that a rigid cervical collar (68%) and a long backboard with soft conforming surface (79%) are appropriate devices to maintain an injured pediatric spine in optimal position. Only 39% believed a rigid long backboard appropriate. Beliefs about appropriate spinal precautions for specific risk factors did not reach consensus. For children 0-4 years, a rigid collar with a soft conforming long backboard were preferred: Glasgow Coma Scale (GCS) 3-8 (32%), focal neurological deficits (38%), neck pain/tenderness (29%), difficulty moving neck (28%), substantial torso injury (39%), high-risk motor vehicle crash (MVC) (40%) and axial load/diving (41%). However for those with GCS 9-13, 28% chose rigid collar with a car seat secured to a mattress gurney while 27% chose a rigid collar with a soft conforming long backboard. For children 5-18 years, a rigid collar with a soft conforming long backboard were preferred: GCS 3-8 (32%), GCS 9-13 (30%), focal neurological deficits (38%), neck pain/tenderness (31%), difficulty moving neck (29%), and substantial torso injury (35%). Respondents chose rigid collar with a rigid long backboard for MVC (42%) and axial load/diving (38%).

Conclusion: EMS providers believed that a rigid collar with a soft conforming long backboard maintain an injured pediatric spine in optimal position, however, there were no consensus beliefs for use of spinal precautions based on risk factors. These findings support the need to develop a pediatric CSI risk assessment tool.

157 EMS Provider Assessment of Comorbid Conditions and Medication History in Injured Older Adults

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Background: Injured older adults are more likely to be under-triaged than younger adults. Reasons for this are largely unknown, but current guidance for EMS providers regarding field triage for medically complex patients with chronic conditions and high-risk medication use is limited and little is known regarding how such information is incorporated into field triage decisions.

Objectives: To assess how EMS providers assess pre-injury comorbid conditions and medication use and determine the extent to which these influence the selection of a destination hospital.

Methods: We conducted a prospective multi-center study of injured older adult EMS patients. All injured patients were eligible regardless of injury severity or acuity level. Interviews were conducted with the patient's EMS provider to collect data on the patient's clinical and demographic factors as well as detailed questions surrounding the EMS providers' field triage decision-making process. Descriptive statistics were used to characterize the study sample and to quantify responses to questions regarding pre-injury patient comorbid conditions, medication use, and field triage.

Results: Data from 4,317 injured older adults was analyzed. The median age of the sample was 75 and the most frequent mechanism of injury was falls (75.3%). The most frequently reported sources of pre-injury medication use included: a written list (44.2%), verbal memory (37.9%), and medication bottles (11.0%), provided by the patient (52.7%), a family member (17.7%), or a facility (21.6%). Only a small proportion of EMS providers indicated comorbid conditions or pre-injury medications influenced field triage decisions (7.0% and 2.3%, respectively). Pre-injury medications that frequently influenced transport decisions included: 1) Warfarin / Coumadin; 2) Blood thinners; specific medication name unknown; and 3) Aspirin.

Conclusion: EMS providers in our sample frequently rely upon patients or the caregivers to provide pre-injury medication information. Field triage decisions are infrequently influenced by comorbid conditions and pre-injury medications. This has implications for the education of EMS providers as well as the design of future field triage guidelines.

158 Early Emergency Outcomes of Patients Attended By Paramedics and Not Transported to Hospital

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Background: Many EMS have introduced paramedic-level protocols to identify patients in whom transport is not required (TNR). There is little follow up data available on the outcomes of such patients.

Objectives: To describe presentations to ED within 48 hours of a TNR decision by paramedics and the relationship with stated reasons for TNR.

Methods: Cohort study of all TNR cases in a city of 380,000 including both EDs (one tertiary mixed and one urban mixed) over 18 months. TNR cases were classified at the time by paramedics as "Not required" (NR), "Patient Refusal" (PR) or "Transport by other Means" (OM). Cases were matched with corresponding ED records using name and date of birth. Primary outcome was the first presentation to either hospital within 48 hours of the "at Patient" time, secondary outcome the ED disposition.

Results: There were 6,477 TNR events, 5,643 (87%) of which had sufficient identifying details. 559 (9.9%) matched one or more ED presentations in the next 48 hours, including 10 patients who were seen in both hospitals. As shown in the table, PR patients were almost twice as likely as NR to present to an ED within 48 hours (11.2% [95%CI 9.9-12.6] vs 6.4% [95%CI 5.6-7.3]) with the greatest difference in the first 6 hours, but NR patients were somewhat more likely to require hospital admission if they did present (46.2% [95%CI 39.3-56.2] vs 35.0% [95%CI 29.0-41.6], P=0.017 Chi-square). The few OM patients were much more likely to present quickly and less likely to require admission.

Conclusion: The relatively high admission rate of NR cases who do present to ED warrants further audit. Nevertheless, paramedic triage is much more accurate than patient self-triage in this setting. OM cases represent a different population but the fact that over 50% did not come to hospital suggests the definition should be reviewed.

159 Authority for Expanded Scope of Practice for Community Paramedics: A National Systematic Legal Review

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Background: Community paramedicine (CP) is a rapidly evolving field within prehospital care where paramedics step outside of their traditional roles of treating acute conditions to provide elements of primary and preventive care. The National Highway Traffic Safety Administration's National EMS scope of practice model serves as guide for states to develop legislation, rules and regulations defining the roles, knowledge base, and skills for EMS providers. It is unclear if current

Outcomes of Patients Not Transported

Type	Number	ED by 6 hours	ED by 24 hours	ED by 48 hours	Critical Care	General Wards	Short Stay	Admission%
Not Required	3291	98(3.0%)	171(5.2%)	210(6.4%)	8	50	39	46.2%
Patient Refusal	2096	131(6.3%)	193(9.2%)	234(11.2%)	6	45	31	35.0%
Other Means	256	109(42.6%)	112(43.8%)	115(44.9%)	1	13	8	19.1%

Table 158: Richardson.

state oversight regarding the scope of practice for paramedics provides clear guidance on the novel functions provided and skills performed by Community Paramedicine programs.

Objectives: To determine the process and authority, as currently defined by state regulations and legislation in the U.S., to expand paramedics' scope of practice in order to perform community paramedicine roles.

Methods: We conducted a systematic review of laws, regulations, and policies from the 50 U.S. states in effect between July 1, 2015 and March 1, 2016 that define or apply to the paramedic scope of practice. We determined if each state's scope of practice included skills unique to community paramedicine. Specifically, we searched for 22 potential community paramedicine activities, categorized into the following skill sets: assessment, treatment/intervention, referrals, and prevention/public health. All data was abstracted and coded into Excel. Data was analyzed using descriptive statistics and 95% confidence intervals

Results: All 50 states had legislation involving EMS. 26% (CI 14-38) of states had legislation specific to CP. Eighty-four percent (44-72) of states had specific statewide guidance on paramedic scope of practice. Forty-three percent (28-58) of states had a clearly defined process/mechanism for expanding the scope of practice such as a special waiver process or pilot program.

Conclusion: There is a lack of guidance and consistency regarding regulatory oversight of CP programs and scope of practice. Further studies are needed to understand best practices around regulation and oversight of community paramedicine.

160 Innovations in Prehospital Delivery Models Incorporating Telehealth: The City of Houston Emergency Medical Services ETHAN Program

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Background: The City of Houston developed a study integrating mobile technology, social services, and patient navigation to attempt to reduce ED crowding resulting from non-urgent patients. Given the historically high levels of emergency department transports for low-level acuity problems, technology can allow for an alternative delivery system. This study provides a thorough description of the ETHAN program in the City of Houston at the Houston Fire Department (Electronic Telehealth and Navigation).

Objectives: The primary objective of this study is to compare the relative effectiveness of a novel, telehealth-based program to a control group in terms of clinical, economic, and utilization outcomes.

Methods: We developed a prospective, quasi-experimental observational study using a comparative effectiveness design between two groups: the intervention group (ETHAN patients) used telehealth, patient navigation to clinics, and taxi transports; the control group represented traditional EMS patients which were treated and transported to local EDs per standard protocol. Using match case control based on primary care diagnosis codes, age, and gender, the groups were compared to explore differences in outcome and quality metrics. This is a comparative effectiveness design.

Results: Nearly 4,000 patients have been treated through this alternate delivery model in the first full year. There is an 82% reduction in ED ambulance transports relative to the baseline group. The median time from EMS notification to back in service was 33 minutes in the ETHAN group versus 83 for traditional EMS transports, ensuring that they can respond to other more emergent incidents and increasing unit productivity. There were no statistically significant differences in either patient satisfaction or mortality, while costs remain substantially lower in the new program when accounting for total transport times despite the initial investment in technology, training, and personnel.

Conclusion: Based on preliminary results, a large-scale mobile-integrated health model—incorporating telehealth and other innovative technologies—is effective at reducing unnecessary ED visits and putting units back in service nearly 2.5x faster.

161 Causes of Elevated Troponins in the Emergency Department and Their Associated Mortality

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Background: Cardiac troponins are components of myocardial cells and are expressed almost exclusively in the heart. Elevated troponin levels usually indicate cell damage/death but not the etiology. The 3rd Universal Definition of myocardial infarction (MI) differentiates between MIs as Type 1 (plaque rupture with thrombus) or Type 2 (imbalance between supply/demand).

Objectives: We determined the frequency of types 1 and 2 MI in a tertiary care ED and their associated in-hospital mortality.

Methods: We performed a structured, retrospective review of all consecutive adult patients in the ED during a 12 month period with elevated troponin I levels (>99th percentile of normal). Type of MI was based on the 3rd Universal Definition. Structured chart review was performed independently by 2 of the authors. MI types and characteristics were evaluated by Chi-square and Mann-Whitney tests.

Results: Of 96,612 ED patients presenting from 5/12-4/13, 13,502 (14%) had troponin measured, of which 1,310 (9.7%) were elevated. Of these, 336 were MI type 1 and 948 MI type 2 (few were MI types 3-5). MI type 2 patients were slightly older, more likely female, and had higher heart rates, BUN and creatinine. Comorbidities were more common in type 2 while cardiac risk factors were more common in type 1. Normal and non-specific ECGs were more common in MI type 2. Initial and subsequent troponin levels were all significantly lower among patients with type 2. Of type 2 MIs, 453 (48%) were related to myocardial supply/demand imbalance (respiratory failure [25%], tachyarrhythmias [18%], sepsis [17%], and hypertension [17%]), while 509 (54%) had multifactorial causes (heart failure [42%], renal failure [39%], stroke [8%], pulmonary embolism [2%]) or indeterminate myocardial injury. In hospital mortality rates were similar between patients with MI type 1 and 2, while more patients with MI type 2 were admitted to intensive care units. (See Singer Figure 1)

Conclusion: Of all ED patients with elevated troponins, ~75% are type 2 MIs. Patients with type 2 MI have fewer cardiac risk factors, more comorbidities, more normal and non specific ECGs, lower initial and subsequent troponins, higher ICU admission rates, but similar mortality vs. type 1 MI.

	Type 1 patients	Type 2 patients	P value
Mean (SD) age, years	69 (14)	72 (16)	0.004
Males, No. (%)	238 (71%	588 (62%)	0.003
Comorbidities, No. (%)	206 (61%)	713 (75%)	<0.001
Cardiac risk factors, No. (%)	283 (84%)	781 (73%)	0.44
Heart rate	78 (19)	84 (20)	<0.001
Mean (SD) BUN, mg/dL	29.0 (19.2)	34.9 (22.4)	<0.001
Mean (SD) creatinine, mg/dL	1.7 (1.9)	2.0 (2.1)	0.02
Mean (95%CI) 1st troponin, ng/ml	0.5 (0.1-2.5)	0.1 (0.1-0.3)	<0.001
Mean (95% CI) 2nd troponin, ng/ml	2.0 (0.3-10.9)	0.2 (0.1-0.4)	<0.001
Mean (95% CI) 2nd troponin, ng/ml	3.0 (0.4-20.2)	0.2 (0.1-0.4)	<0.001
Normal or non-specific ECG, No. (%)	60 (18%)	427 (45%)	<0.001
ICU admissions, No. (%)	235 (70%)	531 (56%)	<0.001
In-hospital mortality, No. (%)	34 (10%)	104 (11%)	0.56

Singer Figure 1

162 Can Types 1 and 2 Myocardial Infarction be Distinguished Based on Serial Troponin?

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Background: The most common types of myocardial infarction (MI) are type 1 (caused by coronary artery occlusion) and type 2 (caused by an imbalance between myocardial supply and demand). Distinguishing between MI types 1 and 2 is critical since the etiology, management and prognosis are significantly different.

Objectives: We attempted to derive a diagnostic algorithm to distinguish between types 1 and 2 based on initial and subsequent serial troponin levels.

Methods: Study Design: Structure retrospective electronic medical record (EMR) review from 5/12-4/13. Setting: Academic suburban ED with ~100,000 annual visits. Subjects: All adults with elevated troponin I (TnI) as defined as >99th percentile (0.04 ng/mL) per the package insert (TnI-Ultra, Siemens, Erlangen, Germany). Measures and Outcomes: Demographic, clinical, electrocardiographic and laboratory data. Patients were classified as type 1 or 2 MI as per the Third Universal Definition. Data Analysis: Serial TNIs compared for type 1 and 2 MI by Mann Whitney U test. Classification and regression tree analysis was used to derive a diagnostic algorithm based on TnI levels to distinguish tpe 1 and 2 MI.

Results: Of 13,502 TnIs measured, 1,310 (9.7%) were elevated. A total of 948 were classified as MI type 2 and 336 as MI type 1. Patients with type 2 were older (72 vs. 69 years, p=.004) and more likely female (38% vs. 29%, p=.003). TnI was significantly higher in type 1 MI at all time points. The diagnostic test characteristics of several classification models are in the table. While fairly specific they lacked sensitivity. The receiver operating characteristics AUC for 1st troponin was 0.72 (95%, CI, 0.69-0.79). In the subset of patients who had 3 serial troponins measured, the best predictive model for Type 1 MI was if the third troponin measured (T3) was > 3, which had a sensitivity 51% and a specificity 95% (AUC 0.83, 95% CI, 0.80-0.86).

Conclusion: TnI is significantly higher at all time points in MI type 1. We could not derive a diagnostic algorithm based on serial TnI levels that was both highly specific and sensitive for distinguishing MI types.

Serial troponins	Type 1 MI		Type 2 MI		P value
	Mean (95% CI)	N	Mean (95% CI)	N	
Troponin POC	0.3 (.1-1.6)	335	0.1 (.1-.2)	947	<.001
Serial troponin 1 (T1)	0.5 (.1-2.5)	331	0.1 (.1-.3)	933	<.001
Serial troponin 2 (T2)	2.0 (.3-10.9)	312	0.2 (.1-.4)	870	<.001
Serial troponin 3 (T3)	3.0 (.4-20.2)	298	0.2 (.1-.4)	800	<.001

Characteristics of model to identify type 1 MI	SEN 95% CI	SPEC	PPV	NPV
(T2 – T1) > .585 or T1 > 1.475	60 54-65	89 87-91	66 61-72	86 84-88
T1 > 1.28	35 30-40	94 92-95	65 58-72	80 78-82
T1 > .908	40 34-45	91 89-93	61 54-67	81 78-83
(T2-T1) > 2.38 or [(T2-T1) < -.009 and T1 > 2.27]	38 33-44	96 94-97	76 69-82	81 79-84

Singer Table 1

163 Miss Rate of Type 1 Myocardial Infarctions When Applying the 2014 NSTEMI Biomarker Guidelines

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Background: The 2014 American Heart Association (AHA) guidelines on the management of non-ST-elevation myocardial infarction (NSTEMI) gives a level 1A recommendation for obtaining cardiac troponins at presentation and again 3-6 hours from the onset of chest pain (CP) for those without EKG changes and low risk presentations. In contrast, the prior guidelines, published in 2011, suggested serial troponins at presentation to a provider and at least 6 hours later. These updates represent an opportunity to expedite emergency department (ED) visits for those with low risk CP. However, few studies have evaluated the diagnostic accuracy of this strategy.

Objectives: To determine the rate of missed Type I myocardial infarction events in patients without troponin elevation from the first blood sample drawn at 6 hours or more after the onset of CP.

Methods: A sub-analysis of patients presenting with CP who were enrolled in a prospective cohort study of ED patients evaluated for suspected ACS. Troponin was measured using the Beckman Coulter's Access II AccuTnI assay (cTnI). High sensitivity troponin was measured using the Abbott Architect high sensitivity troponin I (hsTnI). Type 1 myocardial infarction was defined according to the Second Universal Definition of Myocardial Infarction and based on a review of all available clinical information. Miss rates and confidence intervals were subsequently calculated.

Results: Of 1,538 patients who presented with CP, 0.52% (8/1538) (95% CI: 0.0026-0.0102) with type 1 MI had their first cTnI elevation greater than 6 hours from the onset of their CP. Among these, 6 had a history of known CAD and a concerning history of present illness. If the AHA's recommendation to obtain additional troponin levels beyond 6 hours after symptom onset in patients with intermediate or high index of suspicion for ACS is adhered to, only 2 Type I cardiac events would have been undiagnosed, a rate of 0.13% (2/1538) (95% CI 0.04-0.47%). Of those patients who also had hsTnI drawn, only one of the Type I events would have been detected earlier.

Conclusion: This rate of missed type 1 myocardial infarction in patients with non-elevated troponin values at 6 hours after onset of CP is low. Additional studies are needed to characterize the reliability of patient's recollection of the time of onset of CP.

164 Screening Performance of Trigger Criteria for an Early ECG to Diagnoses STEMI

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Background: There is a zero tolerance culture for missed ST-elevation myocardial infarction (STEMI) in patients arriving to the ED. In cardiology, the ECG is often referred to as the screening test for STEMI with coronary angiography as the diagnostic test. However, in emergency medicine, the ECG is the diagnostic test, and the trigger criteria for early ECG are the true screening tool. The trigger criteria are pre-established screening questions used by intake staff to identify patients in need of an early ECG to diagnose STEMI.

Objectives: In this study, we aim to quantify the diagnostic performance of ED screening criteria used to trigger an early ECG to diagnose STEMI.

Methods: We performed a retrospective cross-sectional cohort study including all adult visits in 2014 from 6 geographically diverse EDs for a total 498,372 visits. Each site has pre-established trigger criteria to identify patients who need early ECGs, defined as one performed within 15 minutes of arrival. Patients with an ECG from another facility or transporting paramedic team used to initiate STEMI care were excluded. Triggering an early ECG was a positive *index test*; and the diagnosis of STEMI during the ED visit or an associated hospital admission was a positive *reference standard*. For example, a patient

Table 1 – Trigger Criteria STEMI Screening Performance

		ED#1	ED#2	ED#3	ED#4	ED#5	ED#6	All
Test Characteristics	STEMI Incidence	0.04%	0.09%	0.12%	0.12%	0.13%	0.14%	0.08%
	MCR (Type II Error)	35.4%	11.7%	6.8%	5.6%	3.4%	2.0%	6.5%
	Sensitivity	65%	88%	93%	94%	97%	98%	93%
	Specificity	92%	87%	87%	91%	72%	81%	88.00%
	PPV	0.003	0.006	0.009	0.012	0.004	0.007	0.006
	NPV	0.99986	0.99987	0.99990	0.99993	0.99994	0.99996	0.99994
	LR(+)	8.25	6.80	7.13	10.28	3.48	5.14	7.79
	LR(-)	0.38	0.13	0.08	0.06	0.05	0.02	0.07
	Diagnostic OR	21.48	50.73	91.76	168.08	74.08	206.06	105.33

whose symptoms prompted an early ECG that was not diagnostic for STEMI, but had an ECG repeated during their ED stay that showed a STEMI, would be considered trigger positive and STEMI positive.

Results: We observed an overall missed case rate (MCR, type II errors) of 6.5% across all 6 EDs ranging from 2-35%. EDs with a higher incidence of STEMI had lower missed case rates, higher screening sensitivity, and lower negative likelihood ratios, but lower specificity. There was greater variability in performance when we examined the diagnostic odds ratio which is independent of disease incidence.

Conclusion: We identified significant variability in the screening performance of trigger criteria for the early detection of STEMI. This suggests that the specific screening questions or processes at these centers warrant further study to improve and standardize performance.

165 The Diagnostic Accuracy of Emergency Physicians and Cardiologists Interpreting Potential STEMI ECGs

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Background: The accurate interpretation of potential ST-segment elevations on electrocardiograms (ECGs) to diagnose acute myocardial infarction (MI) is a critical competency for emergency physicians (EPs) and cardiologists. There is conflicting evidence on the diagnostic accuracy of EPs and cardiologists interpreting potential STEMI ECGs.

Objectives: The primary objective of this study was to determine the diagnostic accuracy of EPs and cardiologists interpreting potential STEMI ECGs.

Methods: We conducted a web-based assessment of the diagnostic accuracy of potential STEMI ECGs of Canadian EPs and cardiologists. They were identified using the membership lists of the Canadian Association of Emergency Physicians and the departments of cardiology at Canadian medical schools. When provided with 20 ECGs of confirmed STEMI patients, EPs and cardiologists were asked to provide a binary Yes/No answer. EPs and cardiologists were blinded to the correct answers. Descriptive statistics were used to described frequencies and counts. Analysis using Rasch Measurement Theory (RUMM2030) was used to explore the relationship between correct interpretation of ECGs and predictive variables such as age, years in practice or type of practice.

Results: 250 EPs and 30 cardiologists (n=280) responded to our survey (total response rate 25%). Average years in practice were 12.5 for EPs (SD 10.6; median 10) and 14.6 for cardiologists (SD 10.6; median 11); 52% of EPs and 93% of cardiologists practiced in an academic setting. Seven of the cardiologists were interventionalists. 47.6% of EPs and 97% of cardiologists practiced at hospitals with 24-hour catheterization capability. The accuracy of EPs for identifying STEMI ECGs was 75% (SD 15%); cardiologists' accuracy was 76% (SD 15.5%). The ability to correctly interpret the ECGs was independent of age, years in practice, or type of practice (community vs. academic).

Conclusion: EPs and cardiologists display similar accuracy for interpreting STEMI ECGs, regardless of age, years in practice or type of practice. The findings of our study suggest the need for focused ECG education for both EPs and cardiologists.

166 Decreased Time From 911 Call to PCI Among Patients Experiencing a STEMI Results in a Decreased One Year Mortality

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Background: Prompt reperfusion of patients undergoing an ST elevation myocardial infarction (STEMI) is essential for improved mortality. The impact on mortality due to prompt recognition of STEMI patients by EMS has not been well described. The time interval from 911 phone call to percutaneous coronary intervention (PCI) represents the coordinated efforts of prehospital and in-hospital providers and has not previously been studied to evaluate the timeliness of intervention.

Objectives: Describe the association between the time interval, 911 call to PCI, and mortality at one year while controlling for potential confounding variables.

Methods: This retrospective analysis included patients that were transported by EMS as a "code STEMI" and underwent PCI. Total time from 911 call to PCI was calculated for each patient and was the independent variable of interest. Each patient's mortality status at one year was the outcome variable, collected by querying medical records and the national death index. Confounding variables such as age, past medical history and risk status were abstracted from hospital records. A logistic regression was conducted to determine the likelihood of survival given differences in time to PCI.

Results: A total of 550 patients of which 68% were male with an average age 59.8 (SD 12.8) were included in the analyses (see Jackson Table 1). The mean reperfusion time was 81.8 min (SD 20.0) and was significantly lower in patients alive at one year (80.8 min, SD 19.7) vs. deceased at one year (93.9 min, SD 19.6), respectively. Odds of survival at one year decreased by 3% (OR 0.97; 95% CI 0.96-0.99) for every one minute increase in time to PCI. This relationship was linear in logistic regression modeling and practically represents a 30% increase in mortality for every 10 minute delay from 911 call to PCI. Age was the only significant confounding variable and was controlled for in the analysis.

Conclusion: These data suggest that managing prehospital time in STEMI patients may have a direct association on decreased mortality. The model produced in this analysis suggests that a linear relationship exists between time to PCI and mortality in the prehospital environment with the probability of survival decreasing significantly as time to PCI increases.

Jackson Table 1

Variable	Survival to 30 Days				Survival to 365 Days			
	No (n=28)	Yes (n=522)	Odds ratio (95% CI)	P-Value	No (n=44)	Yes (n=506)	Odds ratio (95% CI)	P-value
Age (mean, SD)	70.4 (13.5)	59.2 (12.6)	0.94 (0.91-0.96)	<0.001*	67.8 (13.5)	59.1 (12.6)	0.95 (0.93-0.97)	<0.001*
Sex								
Women	12	162	1.66 (0.77-3.60)	0.190	15	159	1.13 (0.59-2.16)	0.715
Men	16	360			29	347		
Cardiogenic Shock								
No	26	504	0.46 (0.10-2.11)	0.309	42	488	0.77 (0.17-3.45)	0.737
Yes	2	18			2	18		
Initial Systolic BP								
<100 mmHG	19	416	0.54 (0.24-1.22)	0.133	32	403	0.68 (0.34-1.37)	0.279
>100 mmHg	9	106			12	103		
Prior MI								
No	19	399	0.65 (0.29-1.48)	0.300	29	389	0.58 (0.30-1.12)	0.102
Yes	9	123			15	117		
Risk Level								
Low Risk	5	245	0.25 (0.09-0.65)	0.003*	11	239	0.37 (0.18-0.75)	0.004*
High Risk	23	277			33	267		
911 Call to Intervention Time	97.3 (20.6)	81.0 (19.7)	0.96 (0.95-0.98)	<0.001*	93.9 (19.6)	80.8 (19.7)	0.97 (0.96-0.99)	<0.001*

167 Bedside Echocardiography and Mitral Valve Inflow Velocity Variation in the Diagnosis of Elevated Intrapericardial Pressure and Cardiac Tamponade.

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Background: Focused bedside echocardiography (FBE) is a key diagnostic tool in differentiating between pericardial effusion (PE) with and without cardiac tamponade (CT), a critical diagnosis in all settings. Currently the ED diagnosis of CT/elevated intrapericardial pressure (EIPP) is usually based on the identification of right atrial collapse (RAC) and/or right ventricular diastolic collapse (RVDC). Abnormally increased mitral valve inflow velocity variation (MVIVV) may be an earlier sign of CT. The diagnostic utility of MVIVV in ED patients with possible CT is unknown.

Objectives: The aim of this study was to determine the discriminant ability of MVIVV measurement in diagnosis of CT/EIPP compared to RAC and RVDC.

Methods: We conducted a prospective cohort study of a convenience sample of adult patients who had circumferential pericardial effusion (PE) identified on FBE in the ED of an urban tertiary care hospital. Sensitivity (Sn) and Specificity (Sp) were calculated for FBE findings of RAC, RVDC (inclusive of RV flattening) and elevated MVIVV in diagnosis of CT/EIPP when compared to cardiology echocardiography (CE) or improvement after pericardiocentesis. CE was considered diagnostic of CT/EIPP if there was any abnormal chamber collapse and/or if there was increased mitral or tricuspid inflow velocity variation.

Results: 28 studies on 25 patients were analyzed. RAC had Sn 0.5 (95%CI 0.26-0.74) and Sp 1 (95% CI 0.63-1); RVDC had Sn 0.75 (95%CI 0.51-0.91) and Sp 0.87 (95% CI 0.47-0.99); elevated MVIVV had Sn 0.7 (95% CI 0.44-0.89) and Sp 1 (95% CI 0.54-1). Out of the 15 FBE that had positive RV findings of CT/EIPP, 7 had RV flattening and 8 had RV collapse. 10 of 28 FBE studies were followed by pericardiocentesis and all had a CE prior to the procedure; 7 out of 10 had RAC, RVDC and elevated MVIVV on the FBE.

Conclusion: We found no statistically significant difference between the accuracy of MVIVV and either RVDC or RAC in the FBE diagnosis of CT/EIPP. Presence of PE with elevated MVIVV but without chamber collapse on FBE might represent early CT, however results should be interpreted within the clinical picture. RA and RV collapse have high Sp for EIPP. RVDC should continue to be used as a mainstay in the diagnosis of CT/EIPP on FBE as it is a well-known finding, is relatively easy to recognize, and had comparable diagnostic accuracy to RAC and MVIVV in our study.

168 Derivation of a Bundle to Improve First Attempt Success at Intubation in the Intensive Care Unit

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Background: A difficult intubation is defined as requiring >2 attempts or 10 minutes to perform. Prediction tools exist to anticipate the difficult intubation, yet two problems remain: 1. Performance of these tools is suboptimal and 2. Critically ill patients have limited tolerance for repeated or prolonged attempts at laryngoscopy. Thus, first attempt success (FAS) is the goal for intubations in the Intensive Care Unit (ICU) as adverse events (AEs) are more likely with each attempt.

Objectives: The goal of this study is to derive a bundle to improve the odds of FAS for ICU intubations.

Methods: Retrospective analysis of prospectively collected continuous quality improvement data in all 809 patients intubated in the ICU of a university medical center from January 1, 2012 to January 1, 2014. Data relating to patient demographics, attempt(s), and complications were analyzed. A negative stepwise multivariate logistic regression analysis was performed to derive a three-item bundle to optimize the odds of FAS and reduce the odds of one or more AE when all three components were performed. Bundle items were chosen from elements in the literature known to improve FAS.

Results: The elements with the highest odds of FAS were: pre-oxygenation to a saturation >93%, use of a neuromuscular blocking agent, and use of video laryngoscopy. Over the study period 461 (57%) patients intubated had all components of the bundle performed and 348 (43%) patients had at least one component missing. FAS was 84.2% when all bundle elements were performed and 69.5% when any component was missing ($p < 0.001$). After controlling for operator experience and specialty, there were higher odds of FAS (aOR 2.61; 95% CI: 1.83-3.72) and reduced odds of an AE (aOR 0.70; 95% CI: 0.51-0.95) when all bundle elements were performed.

Conclusion: These data suggest that a bundle including pre-oxygenation to a saturation >93%, neuromuscular blocking agent use, and video laryngoscopy improved odds of FAS and decreased odds of one or more AE for intubations performed in the ICU. Prospective studies are needed to validate these findings.

169 First Attempt Success at Intubation is Associated with a Lower Odds of Adverse Events in the ICU

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Background: First Attempt Success (FAS) at endotracheal intubation has been associated with a reduced occurrence of adverse events (AEs) in Emergency Department (ED) intubations and, as a result, has become the surrogate outcome of choice in studies on airway management across multiple disciplines. Despite this, there is limited evidence associating FAS with reduced rates of AEs during intubations performed in the intensive care unit (ICU).

Objectives: The aim of this study is to evaluate the association of FAS with odds of AEs during intubations performed by interventionists in the ICU.

Methods: Prospective observational study of 809 consecutive patients intubated in the ICU of a university medical center from January 1, 2012-December 31, 2014. Data were collected through a continuous quality improvement program on all patients intubated in the ICU over the study period. Data relating to patient demographics, each intubation attempt, and AEs were analyzed. An adjusted multivariate logistic regression analysis was used to determine the relationship between FAS and AEs.

Results: Over the 36-month data collection period, a total of 809 patients were intubated, of these 673 were intubated using video laryngoscopy and 136 using direct laryngoscopy. FAS occurred in 635 cases (78.5%) whereas a second attempt was required in 137 cases (16.9%), a third attempt was needed in 28 (3.5%) while four or more attempts were necessary in 9 (1.1%) cases. FAS was associated with at least one AE in 20.2% while > 1 attempt was associated with at least one AE in 66.1% ($p<0.001$). In logistic regression analysis more than one intubation attempt was associated with 8.1 times the odds of an AE (95% CI 5.5 to 12.1), adjusting for method of intubation, use of video laryngoscopy, operator experience, and prior noninvasive ventilation use.

Conclusion: During endotracheal intubation in the ICU, a failed first attempt at intubation is associated with a higher odds of AEs. These data support that FAS is an appropriate outcome when studying airway management in the ICU.

170 Reason for Failed Attempts at Laryngoscopy Differs Between Video and Direct Laryngoscopes

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Background: First attempt success (FAS) has become a preferred outcome in intubation related research because of reduced odds of adverse events. Video Laryngoscopy (VL) has demonstrated increased FAS in recent observational and experimental studies when compared to direct laryngoscopy (DL). Despite this improved FAS with VL, a substantial proportion of intubations with VL require >1 attempt.

Objectives: The aim of this study is to characterize the reasons for failure of VL on first attempt compared to DL.

Methods: Prospective observational study of all patients intubated in the intensive care unit (ICU) of a university medical center from January 1, 2012 to December 31, 2014. The intubation method and devices used, success or failure of each attempt, operator and patient demographics, the presence of difficult airway characteristics (DACs), and occurrences of any complications were recorded through a continuous quality improvement program.

Results: Over the 36-month data collection period, a total of 809 patients were intubated. Of these, 673 were intubated with VL and 136 with DL. Of the first attempt failures (VL 132/673, 20% vs DL 47/136, 35%) reason for failure was reported in 131 and 47 cases respectively. Reasons for failure included: inability to see the vocal cords (VL 47/131, 36%; DL 30/47, 64%, p=0.001), inability to direct the endotracheal tube (VL 52/131, 40%; DL 10/47, 21%, p=0.032), aborted attempt due to inadequate sedation, hypotension, or hypoxemia (VL 28/131, 21%; DL 5/47, 11%, p=0.13) and equipment failure (VL 4/131, 3%; DL 2/47, 4%, p=0.65). Reason for failure did not differ with level of operator experience or laryngoscope blade design.

Conclusion: First attempt failures with DL most commonly occur because of inability to see the vocal cords while a larger proportion of failures with VL occurred because of inability to direct the endotracheal tube. These data present targets for minimizing first attempt failures when performing tracheal intubation in the ICU.

171 Derivation and Validation of a Predictive Model of Difficult Intubation in the Prehospital Setting: Prehospital Difficult Airway Identification Tool (PreDAIT)

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Background: Prehospital endotracheal intubation (ETI) poses unique challenges. As a result, multiple ETI attempts may be more common than in other settings and result in adverse patient outcomes including hypoxia and death. Early identification of difficult ETI cases could allow providers to tailor airway management efforts to minimize complications associated with ETI.

Objectives: We sought to derive and validate a prehospital difficult airway identification tool based on established predictors of difficult ETI.

Methods: We prospectively collected patient and airway data on airway attempts from 16 Advanced Life Support ground agencies from January 2011 to October 2014. Cases that required more than 2 ETI attempts and cases where an alternative airway strategy (e.g. supraglottic airway) was employed after one unsuccessful ETI attempt were categorized as 'difficult'. A random allocation sequence was used to split the data into derivation and validation subsets. Using backward elimination, factors with a p<0.1 were included in multivariable regression for the derivation cohort. This model was used to determine the area under the curve (AUC), and the sensitivity and specificity for each cut point in both the derivation and validation sets.

Results: We collected data on 1,102 cases with 568 in the derivation set (155 difficult cases: 27.3%) and 534 in the validation set (135 difficult cases: 25.3%). Of the collected variables, five factors were predictive of difficult ETI in the derivation model (odds ratio, 95% CI, p-value): Glasgow coma score >3 (2.15, 1.19-3.88, 0.011), limited neck movement (2.24, 1.28-3.93, 0.005), trismus (2.24, 1.09-4.6, 0.028), inability to palpate landmarks of the neck (5.92, 2.77-12.66, <0.001), and fluid in the airway (e.g. blood or emesis) (2.25, 1.51-3.36, <0.001). This was the most parsimonious model and exhibited good fit (Hosmer-Lemeshow test p = 0.167) with an AUC of 0.68 (95% CI 0.64-0.73). Other factors, (age, weight, etc.) were not significant. When applied to the validation set, the model had an AUC of 0.63 (0.58-0.68) with excellent specificity for identifying difficult ETI if ≥3 (98.5%) or ≥4 (99.8%) factors were present.

Conclusion: A simple scoring system assessing five factors may help providers identify difficult ETI in the prehospital setting.

172 Use of Apneic Oxygenation in Rapid Sequence Intubation (RSI) Patients in the Emergency Department

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Background: Apneic oxygenation has been used in anesthesia for many years to prevent desaturation during intubation. There is an abundance of literature to support this practice during elective intubation in the operating room, and many emergency physicians have adopted this practice in their own emergent airway management. Although there is not yet robust evidence to use this practice in an emergent setting, this is becoming standard of care in some emergency departments.

Objectives: We will determine if routine use of apneic oxygenation prevents desaturation during rapid sequence intubation of patients presenting to the emergency department.

Methods: Our study is an ongoing randomized controlled trial of prospectively enrolled patients requiring emergent rapid sequence intubation comparing apneic oxygenation to usual care. Our setting is a community emergency department that sees 115,000 patients a year. This hospital has a new three-year emergency residency program, and apneic oxygenation is not the standard practice. The two arms of the study are usual care at the discretion of treating physician without apneic oxygenation and usual care plus apneic oxygenation. Patients are enrolled 24 hours a day and are randomized based on calendar day of intubation. All members of the intubating team were inserviced on enrollment and data collection. Data collection consists of a post-intubation form; outcomes of interest include highest and lowest oxygen saturation, number of attempts, and need for bag valve mask ventilation.

Results: We present here our first 13 patients. An interim statistical analysis is planned after the first 80 patients. Preliminary data shows lower saturations and increased number of desaturations in the standard care group.

Conclusion: Apneic oxygenation could be a cost-effective, noninvasive way to maintain oxygen saturation during the apneic period in emergent intubations; this study is the first that attempts to measure the effectiveness of this intervention in the emergency department. This study has several limitations. The nature of emergent airway management made it impossible to blind the intubator to the treatment arm. In order to maximize enrollment and diversity of intubators, data collection is done by many different individuals.

173 She Said, He Said—Resident Perceptions of Gender and Leadership in Acute Resuscitations: A Qualitative Analysis

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Background: Effective communication and team dynamics are critical to successfully lead ED resuscitations. Literature suggests that gender can influence leadership style and how leaders are perceived.

Objectives: To explore EM residents' perceptions of gender and its impact on acute resuscitation team dynamics

Methods: This exploratory qualitative study was conducted from 4/1/15 to 6/15/15 at two level 1 trauma centers in New England, where EM residents lead medical/surgical resuscitations. After obtaining verbal consent, a trained qualitative interviewer conducted anonymous, in depth, semi-structured interviews until theme saturation was reached. Subjects were PGY 2-4 EM residents. Interviews were audiotaped, transcribed, de-identified, coded, and analyzed using MAXQDA v12. A resident physician, nurse, and non-clinical research assistant met as a group to code all segments and reach agreement in coding. Thematic content analysis consistent with grounded theory was used to identify themes related to residents' perceptions of gender in the acute resuscitation room.

Results: Sixteen EM residents participated: 6 female, 10 male, (6 PGY2, 6 PGY3, 4 PGY4). Female residents (100%) reported that gender impacted nursing relationships and team dynamics compared to 60% of males. The need to gain the trust of nurses to effectively lead resuscitations was reported by 67% of female and 10% of male residents. Directive and commanding behavior in females was often perceived as overly assertive, while this was more likely to be accepted as a leadership quality in males. Several female residents noted being timid, soft spoken, or having a smaller stature directly affected a female's effectiveness in leading resuscitations. Both genders (75%) reported females faced more challenges to earn respect as leaders, but this effect decreased with experience.

Conclusion: EM residents who lead resuscitations perceived gender as having a major effect on team dynamics. Several themes regarding barriers to effective leadership were perceived as disproportionally affecting females. Findings suggest gender related differences may impact team leadership dynamics and should be addressed in resident training.

Table 1. EM Resident Perceptions of Gender on Emergency Resuscitations

Key Themes	Representative Quotes
Team Dynamics	"I do think people can perceive it as being mean. Or, in females, it's just bitchy. It's not directive. It's bitchy." *[Interviewer] So if you're directive as a female, it's bitchy?* "It's bitchy." *[Interviewer] If you're directive as a male, it's. . .?* "It's just aggressive or a leader leading, or whatever it is. Not bitchy."
Trust and Respect of Team	"Just, I think that they have to prove themselves a little more. Like I said, you know, a big, tall male walks in the room with a loud voice. . .I think. . .people would default to respecting and listening to what they have to say first and questioning them second. But, if a woman walks in, I think you have to prove yourself over time first before you get the same respect that maybe their peers would get."
Gender Inequity and Uphill Battle	"I think there's a natural, and unfortunate as it is built in our system, a natural preference for male leaders in medicine, and in general. They don't have to know peoples' names and they're accepted more. The nurses don't get offended if they don't know their names. But if I don't know their names there's much more. . ..I've worked very hard to get on the good side of those people."

174 Emergency Medicine Morbidity and Mortality Conference and Culture of Safety: The Resident Perspective

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Background: Morbidity and mortality conference (M+M) is an emergency medicine (EM) ACGME requirement, but little is known about its role is safety culture.

Objectives: We aimed to determine if EM M+Ms have the elements of a strong culture of safety, including robust case reporting, a non-punitive environment, and follow up.

Methods: In May 2015 we conducted a survey of EM residents at 33 programs across the U.S., including both 3 and 4-year programs. The survey used questions from both a previously tested and administered survey of EM program directors and the AHRQ Culture of Safety Survey. Surveys were administered online (REDCap). Percentages were computed after excluding missing values. Data was analyzed with STATA MP 13.1.

Results: The overall survey response rate was 80.3% (1002/1248); ≥70% at each site. 60.3% of residents have never submitted a case of theirs to M+M; 20.6% have submitted 1, and 19.2% have submitted ≥2. 55.7% have had their case presented at M+M (27.3% 1 case, 28.4% ≥2). Residents identified the most important objective of M+M as discuss adverse outcomes (35.6%), identify systems errors (23.9%), discuss interesting cases (13.1%), identify cognitive errors (11.3%), or teach individual professional accountability (6.6%). 10.2% of respondents agree that M+M is punitive, 17.4% are neutral, and 72.4% disagree. 7.6% report that issues raised at M+M always lead to change while 88.3% report they sometimes do and 4.1% report they never do. 56.2% responded that changes made due to M+M are reported back to the residents while 43.8% noted that changes are not regularly reported back. Of residents who have had cases presented at M+M, 24.1% responded that there is regular debriefing, 65.2% responded that there is not, and 10.6% were unsure. 87.4% feel M+M is a valuable educational didactic session, and 78.3% believe M+M contributes to culture of safety in their institution.

Conclusion: While most residents believe M+M is a valuable didactic session and contributes to culture of safety in their institution, the majority have never submitted a case of theirs to M+M. There are opportunities to support the culture of safety by improving communication of changes made in response to issues raised at M+M, debriefing with residents who have had cases presented at M+M, and reducing the likelihood that residents view M+M as punitive.

175 USMLE Scores Predict Success in ABEM Initial Certification

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Background: ACGME accredited EM residency programs aim to have all their residents achieve initial certification via the American

Variables predicting first-attempt success at ABEM certification								
	ABEM Qualifying Examination				ABEM Qualifying and Oral Examination			
		Cutoff scores predicting success				Cutoff scores predicting success		
	ROC AUC (95% CI)	90% PPV	95% PPV	99% PPV	ROC AUC (95% CI)	90% PPV	95% PPV	99% PPV
USMLE Step 1	0.743 (0.624-0.862)	204	217	247	0.648 (0.511-0.785)	208	231	
USMLE Step 2 CK	0.849 (0.726-0.971)	211	219	236	0.771 (0.646-0.896)	217	229	252
Composite Score (Step 1 + Step 2)	0.833 (0.700-0.966)	419	432	462	0.717 (0.568-0.865)	430	453	504

Table 175: Harmouche.

Board of Emergency Medicine (ABEM). In 2014, 90% of residents who took the qualifying exam passed it on the first attempt and 96% passed the oral examination on their first attempt. While selecting medical students to join the program, often the only objective test data available to EM program directors are United States Medical Licensing Examination (USMLE) Step 1 and Step 2 Clinical Knowledge (CK) scores. There is no data on whether performance on USMLE predicts success in ABEM certification.

Objectives: To determine the presence and strength of any association between USMLE scores and first-time success on the ABEM Qualifying Examination and ABEM Oral Certification Examination.

Methods: This was a retrospective cohort study utilizing data from residents graduating between 2009 and 2011 from 9 ACGME-accredited EM programs. Step 1 score, Step 2 score and pass/fail results from the first-attempt at ABEM qualifying and oral examinations were collected and analyzed. A composite score was defined as the sum of Step 1 and Step 2 scores. ROC curves were obtained using univariable logistic regression analysis.

Results: Data from 196 residents were available for the study. Median Step 1, Step 2 and composite score were 218 (IQR 207-232), 228 (IQR 217-239) and 444 (IQR 427-468) respectively. First-time pass rates were 95% for the qualifying examination and 93% for both parts of the examination. Step 2 and composite scores were better predictors of achieving ABEM initial certification compared to Step 1 score (AUC 0.771, 0.717 and 0.648 respectively). Step 1 score of 204, Step 2 score of 211 and composite score of 419 predicted a 90% chance of passing the written board, while scores of 231, 229 and 453 respectively predicted a 95% chance of passing both boards (see *author name* Table 1).

Conclusion: Higher USMLE Step 1, Step 2 CK and composite scores are associated with better performance on ABEM examinations with Step 2 CK being the strongest predictor. Cut-off scores for USMLE Step 1, Step 2 CK and composite score were established to predict first-time success on ABEM Initial Certification.

176 Comparisons of Clinical Training in 2015: 3- and 4-Year Emergency Medicine Programs

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Background: During the development of emergency medicine residencies, program lengths were 2 and 3 years long. The American Board of Emergency Medicine eventually decided that 36 months of training were required to be eligible for board certification in EM. The current trend is moving toward 3 year programs, with 4 year programs becoming the minority.

Objectives: This purpose of this study is to compare the curricula between 3 and 4 year emergency medicine programs as well reveal the variety of experiences offered during a fourth year of residency.

Methods: The study sample consisted of all emergency medicine residency programs listed on the ACGME website in 2015. Two EM residents collected the data from curricula on program websites. Descriptive statistics were used to assess the range within 4 year program's curricula and amount of time spent on clinical rotations in comparison to 3-year programs.

Results: The sample included 168 EM residency programs. 18.4% of residencies (31/168) are 4-year training programs. 4 year residencies were found to allow over twice as much time on elective rotations (4 year median 4.0 blocks, 3 year median 1.5 blocks). 4 year programs also spend more total time in the ED (4 year median 30.0 blocks, 3 year median 21.5 blocks). The amount of additional ED time spent during 4th year of residency alone ranges from 5.5 to 11 rotation blocks. 4-year programs spend more time in the ICU (4 year median 5.0 blocks, 3 year median 3.75 blocks). There are 20 different rotations offered during the 4th year of residency amongst the 4 year programs. 29% (9/31) of 4 year programs utilize the 4th year solely for additional ED and elective time. 58% (18/31) of programs offer rotations unique to the 4th year that are not part of year 1-3 curricula.

Conclusion: While it is accepted that the amount of training necessary to become a competent board-certified emergency physician is 3 years, there remains a selection of programs that continue to require a fourth year of experience. This review of emergency medicine residency curricula reveals the wide variety of experiences offered during a fourth year of residency. This additional year of residency seems to be a worthwhile endeavor for programs and residents willing to put forth the time and money. However, as emergency medicine curricula become more uniform, one could expect a continued trend toward 3-year residency training programs as the standard.

177 The Impact of a Pulmonary Embolism Response Team (PERT) on the Diagnosis, Treatment and Outcomes in Patients with Severe PE Over Time

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Background: The treatment for patients with severe pulmonary embolism (PE) is variable. Multidisciplinary response teams are being implemented to achieve consensus regarding treatment of patients with severe PE.

Objectives: To determine how the existence of a pulmonary embolism response team (PERT) changes the diagnosis, treatment, and outcomes of severe PE over time.

Methods: We examined the time trend of patient, treatment, and outcome characteristics for patients with severe PE after the implementation of PERT at a university hospital. We defined severe PE as central (lobar, main pulmonary artery or saddle) PE plus: SBP ≤90 mmHg, HR ≥100 bpm, right heart strain on CT or echocardiogram, troponin-t ≥0.04 ng/ml or NT-proBNP ≥500 pg/ml. Data were grouped into five time intervals: between 10/12-1/15. Cochran-Armitage trend tests were used to evaluate change over time.

Results: 369 patients had severe PE. Patient characteristics (age, gender, comorbidity) were consistent over time. There were more PERT consults over time (p-trend=0.076) and more low risk PEs were identified (p-trend=0.0417). There was an increase in the use of lower extremity US (p-trend=0.03) and ventilation/perfusion (V/Q) scans (p-trend 0.0006) but no difference in treatment executed by PERT (inferior vena cava filters [p-trend=0.40], surgical thrombectomy [p-trend=0.39], systemic [p-trend=0.73] or catheter directed thrombolysis [p-trend=0.18]. Intensive care unit admissions (p-trend=0.97), 30-day death (p-trend=0.095) and inpatient mortality (p-trend=0.077) did not change.

Conclusion: With the implementation of a multidisciplinary PERT, treatment and outcomes for patients with severe PE remained the consistent over time.

178 Financial Implications of the EM Interview Season

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Background: Emergency Medicine residency interviews are an important, yet costly process for programs and applicants. We sought to determine the total economic burden of this process. We are hopeful our results may start the conversation on ways to reduce the costs of the interview process.

Objectives: The total economic impact of the EM interview season is unknown. We attempt to calculate total dollars used by EM residency programs and estimated dollars to be spent by senior medical students.

Methods: IRB-approved, piloted email surveys were sent to accredited (ACGME and AOA) EM Program Directors (PD) and M4 medical student members of EMRA. Participants were surveyed in August 2015. PD questions included demographics, faculty, resident and administrative assistant time used, along with dollars spent during the 2014-2015 interview season. M4 questions included demographics and estimated dollars to be spent in the 2015-2016 season. Results were reported using descriptive statistics. Financial data were correlated with academic EM faculty and resident salary surveys and administrative assistant labor statistics.

Results: 82/204 EM PDs completed the survey, reporting an average annual cost of $224,712 per program to review, screen and interview applicants based on time spent by faculty, resident and administrative assistants. 80% of EM program costs were due to faculty hours. 213/1425 EM bound M4 students completed the survey, reporting an average annual estimate of $6,838 per student to apply and interview. 63% of estimated costs were due to airfare and lodging. 44% of students report they will limit the number of programs they apply to due to costs. Loans and credit cards will be the top two methods of payments for these costs by students. Extrapolating EM program salaries with hours spent, the economic burden of an interview season for EM programs is approximately $51,683,582. M4 students plan to spend $22,722,674 in the current cycle.

Conclusion: EM residency programs and applicants appear to spend over 74 million dollars per cycle on the interview process. EM residency programs may save resources by reducing faculty hours associated with the interview process. Applicants may reduce travel costs by participating in video interviews, reducing program applications and attending regionalized interview days.

179 S-Wave Voltage in V1 to V3 is Lower in Left Bundle Branch Block Patients with Acute Left Anterior Descending Artery Occlusion

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Background: Voltage in the precordial ECG leads is known to be of lower amplitude in the setting of ST-elevation myocardial infarction (STEMI) in patients with normal conduction.

Objectives: Here we investigate S-wave voltage in patients with left bundle branch block (LBBB) and acute left anterior descending artery occlusion (LADO). We hypothesize that S-wave voltage in the anterior leads will be lower in LBBB patients with LADO.

Methods: This retrospective study was conducted at three STEMI-referral EDs. The LADO group consisted of ED patients with LBBB and angiographically-proven complete LADO or culprit lesion and troponin-I $\geq$ 10 ng/mL. The control group consisted of consecutive ED patients with LBBB and symptoms of ischemia with either negative serial troponin-I (no-MI patients) or positive troponin-I and negative emergent coronary angiography or echocardiography (Non-STEMI patients). The S-wave amplitude was measured to the nearest 0.5 mm in leads V1-V3 and recorded as a positive number. Statistics were by Mann-Whitney-U and McNemar's tests.

Results: The LADO and control groups consisted of 20 and 129 patients. The median [IQR] sum of S-wave amplitude in leads V1, V2, and V3 (ΣS|V1-V3|) was less for LADO (45.5 mm [34.75,59.5]) compared to control patients (65 mm [52,83]; $P < 0.001$). These findings held true when each lead was compared individually as well (see Table; $p < 0.01$ for all). ΣS|V1-V3| $\leq$ 40 mm had 90% [95% CI 83-94] specificity and 40% [20-64] sensitivity for the diagnosis of LADO in the setting of LBBB; this criterion was comparable to both the > 5 mm ST-elevation cutoff of the original Sgarbossa rule (specificity 91% [84-95] and sensitivity 50% [26-75]) and the ST-elevation/S-wave ratio (ST/S) $\leq$ -0.25 criterion of the modified Sgarbossa rule (specificity 91% [84-95] and sensitivity 78% [40-96]) (P = NS for all).

Conclusion: In the setting of LADO in LBBB, the S-wave voltage in leads V1-V3 is lower than in patients without LADO. This is likely due to a loss of myocardial conduction in the setting of LADO. A cutoff of ΣS|V1-V3| $\leq$ 40 mm leads to high specificity for the diagnosis of LADO in LBBB. Larger, multicenter studies are needed to investigate changes in QRS amplitude across arterial territories and to perform multivariate analysis of ECG diagnostic criteria for STEMI in LBBB.

Table: S-Wave Amplitude in Leads V1-V3 in LBBB

	LADO (n = 20)	**No LADO** (n = 129)
V1, mm Median [IQR]	**12.75** [6.75,17.5]	**17.5** [14,22]
V2	**16.75** [12.75,22.5]	**24.5** [20.5,33]
V3	**14** [12,22.5]	**21.5** [16.5,28.0]
ΣS|V1-V3|	**45.5** [34.75,59.5	**65** [52,83]

$P < 0.01$ for all LADO vs. control group

Table 179: Dodd.

180 Effect of Electrolytes Other than Potassium on Electrocardiograms of End Stage Renal Disease Patients

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Background: End stage renal disease (ESRD) patients suffer from multiple electrolyte abnormalities. Potassium has been studied the most because abnormal levels can cause changes on electrocardiograms (ECG) and result in fatal arrhythmia. The effects of electrolytes, other than potassium, on the ECG have not been well studied. We propose to evaluate the effect of electrolytes on ECGs of ESRD patients.

Objectives: The goal is to evaluate the effect of calcium (Ca), bicarbonate (HCO3) and blood urea nitrogen (BUN) on ECG parameters.

Methods: This retrospective study was conducted in a large inner city public hospital. Patients presenting to the Emergency Department with ESRD and hyperkalemia from June 2012 to December of 2014 were enrolled & their ECGs & electrolytes were collected. ECGs were analyzed for T and R wave amplitudes & QRS and PR durations. Correlation of each electrolyte against T amplitude (Tamp), T/R ratio, QRS & PR duration was analyzed, while keeping others constant. Regression analysis was performed looking for significant correlation.

Results: Three hundred seventy two ECGs with their corresponding electrolytes, collected from 75 patients, were analyzed. This cohort was 56% male & 95% Hispanic with a median age of 44 years. Mean ionized serum Ca was 0.97 mEq/L, BUN was 105.53 mEq/L, HCO3 was 20.28 mEq/L & potassium was 6.17 mEq/L. On regression analysis, statistically significant correlations ($p<0.05$) were noted for the following electrolytes: Ca correlated to V2 T amp ($R^2=0.012$), V4 Tamp ($R^2=0.017$), HCO3 to V2 Tamp ($R^2=0.015$), V3 Tamp ($R^2=0.018$), and BUN to V3 Tamp ($R^2=0.012$), V4 T/R ($R^2=0.012$), and QRS ($R^2=0.02$). The largest correlation was noted between BUN and QRS; BUN explained 2% of the variance in QRS.

Conclusion: Calcium, BUN & HCO3 are electrolytes that have statistically significant effects on the repolarization aspect of ECGs in ESRD patients. However, the largest correlation, noted between BUN &QRS, only explained a variance of 2%. Even though these effects are statistically significant, their impact is clinically negligible

181 Does a Single Dose of 4mg IV Ondansetron Cause a Clinically Prolonged QTc in the Undifferentiated Nauseated ED Patient?

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Background: Ondansetron is a commonly used antiemetic in the ED. Studies indicate that ondansetron may cause a prolongation of the QTc interval leading to increased risk of arrhythmias. Interval increases as low as 20 msec are considered clinically significant by expert opinion. Most of the current data supporting QTc prolongation following IV ondansetron comes from the anesthesia literature. These studies are confounded by the use of anesthetics and procedure-induced hypothermia, and are not directly applicable to the ED population. Additionally, ED patients are often undifferentiated and medications are often given without complete knowledge of the patient's history.

Objectives: First prospective study examining the risk of QTc prolongation following a single dose of 4 mg IV ondansetron in the undifferentiated nauseated ED patient.

Methods: This is a prospective, single-center, observational study. We enrolled a convenience sample of adult patients who were ordered a single dose of IV ondansetron by their provider for the treatment of undifferentiated nausea. Exclusion criteria includes: critically ill, prior ondansetron use pre-hospital or during ED course, forensic patients, pregnant patients, or patients unable to give consent. ECGs were obtained prior to and five minutes after ondansetron administration. Primarily endpoint was change in QTc. Secondary endpoints were cardiac arrhythmias or significant cardiac events. Statistics for the change in QTc were calculated using a paired, one-sided t-test with the null hypothesis that a single dose of 4mg IV ondansetron will not cause a significant prolongation.

Results: A total of 20 patients were enrolled between June to November 2015. Enrollment is ongoing. The mean increase in QTc post-ondansetron was 14.1 msec (95% CI 5.5-infinity), (p= 0.005 for the one tailed test, power 0.87). QTc increased beyond 20 msec in 20% (4/20) of patients. Subgroup analysis will be performed and risk for QTc prolongation will be further stratified for initial QTc, medication history, and cardiac history.

Conclusion: Our preliminary data shows that ondansetron causes a moderate QTc prolongation. Our current data is limited by small sample size. Future data analysis will focus on specific subgroups that may be particularly sensitive to QTc prolongation.

182 Does Readiness to Change Vary by Reason for Visit: Implications for Targeted Screening for Risky Drinking in ED Patients

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Background: ED visits for injury and illness related to alcohol misuse are common. Brief Intervention with Referral for Treatment (SBIRT) programs have often focused on injured over medical patients for targeted screening based on what is considered a 'teachable moment.' SBIRT programs typically use "readiness to change" (RTC) as an important change indicator to guide brief interventions.

Objectives: To examine differences in readiness to change (RTC) risky alcohol use by reason for visit (RFV). We hypothesized that RTC risky alcohol use in ED patients would be associated with RFV.

Methods: We surveyed adult patients in an urban academic ED to assess if RTC alcohol use differed by RFV among those at risk for an alcohol use disorder (AUD). We used the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) to assess alcohol misuse risk and 100 mm visual analog scales to assess readiness to, importance of, and confidence about making change. Patients responded yes/no to "Are you here because of an injury, such as car accident, fight or fall?" to determine RFV. We used Wilcoxon Rank Sum Tests to assess statistical significance in RTC and other parameters by RFV.

Results: We surveyed 285 adult ED patients: Overall, 37% were at risk for an AUD and 29% had an injury RFV. More men (46%) than women (33%) reported risky drinking (p=0.048). Injury as the RFV was similar for men and women (36% vs 26%, p=0.096). Both injured and non-injured patients with problematic drinking reported similar readiness to (RTC), importance of, and confidence about making change. (Torres Table 1)

Conclusion: Non-injury RFV was more common in patients with risky drinking behavior and RTC was similar regardless of RFV. Both groups reported similar importance to and confidence about their ability to change. Based on our results, RFV (injury vs non-injury) is not associated with readiness to change drinking behavior, and therefore does not provide useful information about which patients should be targeted in the ED with an intervention such as SBIRT.

Torres Table 1. Readiness to, importance of, and confidence in making change to drinking behavior

	Injury group (N=32)		Non-injury group (N=68)		P value*
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Readiness to change	53.3 (39.0)	60 (12-95)	62.0 (38.3)	78.5 (19.5-92.5)	0.394
Importance to change	67.1 (40.9)	93 (15-99)	68.2 (37.8)	88 (43-96.5)	0.490
Confident about change	80.9 (27.6)	94 (78.5-98.5)	83.6 (21.9)	93 (74.5-97.5)	0.973

*Wilcoxon Rank Sum Test

183 Recent Trends in Emergency Department Visits for Abdominal Pain— Younger Patients, More Repeat Visits, More Severe Pain

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Background: Abdominal pain is the most common reason for visit in US emergency departments (EDs). The number of visits for

abdominal pain has been increasing in recent years. There is controversy regarding the reasons for that increase.

Objectives: Our objective was to explore trends in recent years (2007- 2011) in demographics and disposition decisions for patients whose reason for visit was related to abdominal pain.

Methods: This was a retrospective analysis of ED visits conducted using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), a representative sample of the US ED visits from 2007 through 2011. All patients designated in the NHAMCS with a reason for visit related to abdominal or pelvic pain were included in analyses exclusive of pregnancy or trauma-related complaints. The demographics and disposition of each visit were tabulated and trends analyzed using survey-weighted logistic regression.

Results: There were an estimated 18.7 million visits for abdominal pain in 2007 and 23.0 million in 2011, a 23% increase in total visits. In addition, the percent of all ED visits related to abdominal pain increased by 2.9%. There was greater relative growth among patients with more than 2 visits in the prior year (16.1%), and, those with severe pain (4.9%). Over the 5 years studied, patients were more likely to be younger (6.8-12.2%), female (3.3%), or, on Medicaid (7.9%), p<0.05.

Conclusion: There was significant increase in abdominal pain, particularly among younger patients with serial visits and Medicaid insurance. Despite the observation that they were more likely to present in significant pain (>8), they were also more likely to be discharged from the ED. These trends suggest that the cause of abdominal pain may be changing to represent more patients who are in need of pain control and fewer that require surgery or hospitalization.

Characteristic	2007	2009	2011	Absolute Change	Relative Change	p-value for Trend	p-value for Category per Year
Patient							
18-24	24.5%	24.9%	26.2%	1.7%	6.9%	0.032	**0.009**
25-34	23.4%	22.0%	25.0%	1.6%	6.8%	0.029	
35-44	18.8%	20.3%	21.1%	2.3%	12.2%	0.014	
45-54	18.7%	17.3%	18.1%	-0.6%	-3.2%	0.902	
55-64	19.6%	18.0%	18.8%	-0.8%	-4.1%	0.67	
65+	19.7%	19.4%	18.8%	-0.9%	-4.6%	0.572	
Gender							
Male	16.8%	15.6%	17.2%	0.4%	2.4%	0.183	0.166
Female	24.0%	24.1%	24.8%	0.8%	3.3%	0.041	
Race							
White	20.8%	20.3%	21.4%	0.6%	2.9%	0.033	0.911
Non-white	21.1%	20.8%	21.9%	0.8%	3.8%	0.137	
Source of Payment							
Private insurance	22.5%	22.2%	23.1%	0.6%	2.7%	0.192	**0.023**
Medicaid	21.6%	22.2%	23.3%	1.7%	7.9%	0.016	
Medicare	19.6%	18.8%	18.6%	-1.0%	-5.1%	0.437	
Self-pay	20.8%	18.3%	20.5%	-0.3%	-1.4%	0.542	
Previous Care							
>2 visits in past year	20.5%	20.7%	23.8%	3.3%	16.1%	0.002	**0.002**
Disposition							
Discharged	81.4%	82.0%	83.9%	2.5%	3.1%	0.08	0.087
Observation	2.6%	2.1%	3.0%	0.4%	15.4%	0.493	
Admitted	17.3%	16.0%	14.6%	-2.7%	-15.6%	0.077	
Admitted to ICU	1.3%	2.1%	1.6%	0.3%	23.1%	0.831	
Percent in Severe Pain (>=8)	34.7%	37.0%	36.4%	1.7%	4.9%	0.028	**0.028**
Overall	20.9%	20.4%	21.5%	0.6%	2.9%	0.008	**0.008**

Table 183: Meltzer.

184 Emergency Department Utilization of Opioid Analgesics vs. Non-Opioid Therapies for Abdominal Pain

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Background: Abdominal pain is the most common reason for visiting U.S. emergency departments (EDs). There have been recent increases in the use of opioid analgesics in ED visits, and greater increases in visits involving abdominal pain.

Objectives: We explore recent trends in ED use of opioid and non-opioid medications for abdominal pain visits from 2007-11.

Methods: A retrospective review of data from the National Hospital Ambulatory Medical Care Survey, 2007-2011 was performed. All encounters with a reason for visit related to abdominal or pelvic pain were included in analysis, excluding pregnancy or trauma- related complaints. We examined opioid and non-opioid medication use including ED administration and discharge prescriptions in 2007 and 2011. We specifically examined changes in the use of the 5 most common specific opioids analgesics, non-opioid analgesics (i.e. acetaminophen & non-steroidal anti-inflammatory drugs), acid suppressing agents, anti-emetics, and laxatives/stool softeners. The proportion of visits involving each medication was tabulated and trends analyzed using survey-weighted logistic regression.

Results: There were an estimated 18.7 million visits for abdominal pain in 2007 and 23.0 million in 2011. Opioid use increased 11.9% from 2007 to 2011, from 35.2% to 39.4% of visits, p=0.01. The most commonly used opioid in 2011 was hydromorphone, at 14.1% while the opioid with the greatest increase in use between 2007 and 2011 was oxycodone, with a 53.2% increase (p=0.001). Use of non-opioid analgesics did not change over time. Use of acid-suppressing medications remained stable while use of anti-emetics and laxatives/stool softeners increased.

Conclusion: Comparing ED visits in 2007 and 2011, opioid analgesic use grew more than non-opioids, particularly those with high-potency and abuse potential. Although opioids seem to be the mainstay of pain management for abdominal complaints, there were also increases in other ancillary therapies.

Decrease Font Size **Trends in ED Medication Utilization for Abdominal Pain Visits**

Medication	2007 % Visits	2011 % Visits	% Change	p-Value
Acid suppressant	13.9%	14.4%	3.6%	0.313
Antiemetic	39.2%	43.0%	9.7%	0.015
Laxative/stool softener	2.3%	3.3%	43.5%	0.001
Non-opioid analgesic	22.1%	23.5%	6.3%	0.046
Opioids				
Codeine	0.8%	0.7%	-12.5%	0.858
Hydrocodone	12.0%	13.3%	10.8%	0.274
Hydromorphone	11.4%	14.1%	27.3%	0.028
Morphine	11.8%	12.7%	7.6%	0.341
Oxycodone	4.7%	7.2%	53.2%	0.001

Table 184: Mazer-Amirshahi.

185 Derivation and Validation of a Record Linkage Algorithm Between EMS and the Emergency Department Using Machine Learning

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Background: Electronic patient care reports (ePCR) by EMS agencies detail prehospital treatment, on scene bystander information, and other critical information important to the ED and subsequent hospital stay. Prior unsupervised record linkage algorithms by Newgard in 2012 successfully matched 80% of records when using comparable data. Supervised techniques generally outperform unsupervised ones, but have not previously been used for record linkage.

Objectives: To derive and validate an automated record linkage algorithm between EMS ePCR's and ED records using supervised machine learning techniques.

Methods: The study took place at an academic level 1 trauma center with annual census of 56k. All consecutive ePCR's from a single EMS provider between 07/01/2013 and 06/15/2015 were included. Patients were excluded if they were transported to labor and delivery (1.8%), were not transported to the ED (0.3%), ePCR contained no demographic data (0.4%), or could not be manually matched by the

Feature	Description	Odds Ratio
dob_match	date of birth is identical in both records	522.6
lastname_match	last name is identical in both records	54
age_match	age is identical in both records	32.2
firstname_match	first name identical in both records	15.5
missing_ems_dob	missing variable indicator if date of birth is missing from ePCR	8.8
missing_ems_age	missing variable indicator if age missing from ePCR	8.7
SSN_levenshtein	levenshtein edit distance between social security numbers in each record	7.4
firstinitial_match	first initial identical in both records	6.7
missing_ems_firstname	missing variable indicator if first name is missing from ePCR	6.2
lastinitial_match	last initial identical in both records	5.5
gender_match	gender is identical in both records	4.5
last_name_jw	Jaro-Winkler edit distance between the two last names	2.5
first_name_jw	Jaro-Winkler edit distance between the two first names	2.2
missing_ems_ssn	missing variable indicator if social security number missing from ePCR	2.1
age_diff	difference in age between two records	0.6
missing_ems_lastname	missing variable indicator if last name missing from ePCR records	0.7
missing_bi_age	missing variable indicator if age missing from ED data	0.7
missing_bi_dob	missing variable indicator if date of birth missing from ED data	1
missing_bi_firstname	missing variable indicator if first name missing from ED data	1
missing_bi_lastname	missing variable indicator if last name missing from ED data	1
missing_bi_gender	missing variable indicator if gender missing from ED data	1
missing_bi_ssn	missing variable indicator if social security number missing from ED data	1
missing_ems_gender	missing variable indicator if gender missing from ePCR	1

Table 185: Tlimat.

reviewer (1.7%). A reviewer matched ePCR's to a list of ED patients who were registered 2 hours prior and 2 hours after EMS arrival time. Data was randomly split into 80%/20% training and validation data sets. A logistic regression model was then trained and validated using manually matched records as positive examples and all remaining ED records in the 4 hour time span as negative examples. We created missing indicator variables and re-weighted negative examples to account for class imbalance.

Results: A total of 13,406 ePCRs were included in the study after 625 records were excluded as detailed above. Table 1 lists model features and their respective odds ratios. We found the algorithm on the validation data set had a sensitivity of 98.9%, positive predictive value of 99.5%, with an AUC of 0.99.

Conclusion: A supervised record linkage algorithm performed significantly better than previous unsupervised algorithms (99% vs 80%). Future work will be needed to externally validate this algorithm at other institutions.

186 Prospective Evaluation of an Expert Derived Deterministic Algorithm to Match EMS Patient Care Reports to Emergency Department Records

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Background: Patient Care Reports from EMS provide critical information to emergency department providers including initial presentation, EMS treatments, as well as condition of the home environment. We previously developed and implemented a deterministic record linkage algorithm using expert knowledge that has been linking EMS records to ED records in real-time. In this study, we prospectively evaluated the effectiveness of this expert-derived record linkage algorithm in clinical use.

Objectives: To prospectively validate the effectiveness of a previously developed expert derived record linkage algorithm between EMS patient care reports and Emergency Department records.

Methods: This was a prospective internal validation of a previously deployed algorithm developed using expert knowledge. The study took place at an academic level 1 trauma center with annual ED volume of 56,000. All consecutive ePCR's from a single EMS provider between 07/01/2013 and 06/15/2015 were included. No patients were excluded. A reviewer manually matched ePCR's to a list of ED patients to provide a gold standard. A second reviewer then sub-sampled 10% of those. A third reviewer adjudicated any discrepancies. The matching algorithm is presented in Figure 1.

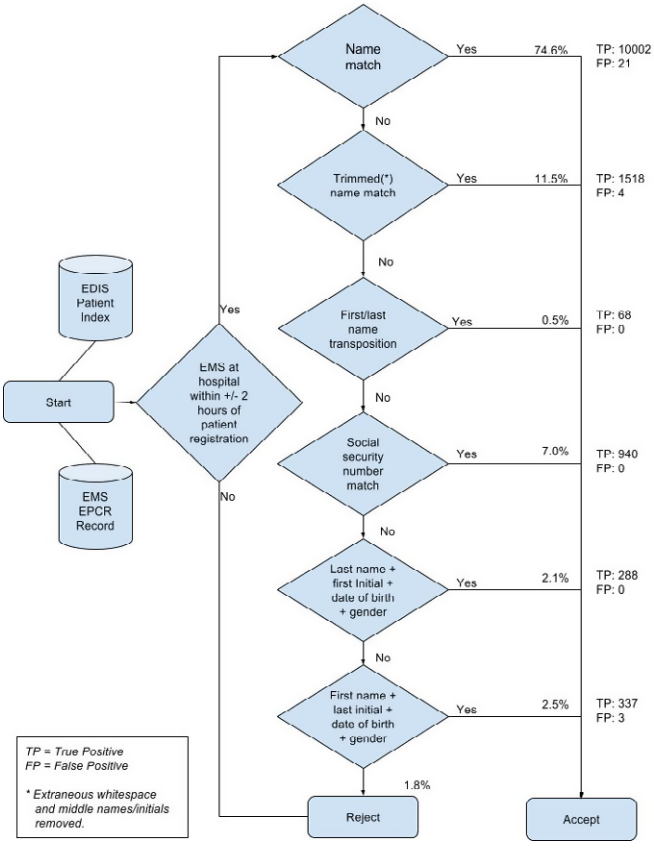

Figure 186 – Redfield

Results: A total of 14,031 ePCRs were included in the study. There were 28 false positive matches (0.2%) and 234 false negative matches (27.5%). The algorithm had a sensitivity of 98.3%, specificity of 96%, PPV of 99.7% and a NPV of 72%.

Conclusion: The expert created deterministic matching algorithm had satisfactory sensitivity and PPV in matching patients brought in by EMS with hospital records. There were several patients with the same name who were incorrectly matched. These performance characteristics would be adequate for prospective clinical usage in situations where a clinician would still apply clinical judgment. However, algorithms with performance characteristics approximating 100% would still be needed for completed automated use cases such as for clinical or epidemiological research. Limitations include a single center with a single EMS agency.

187 Ambulance Utilization and Patient Cost Perceptions

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Background: Up to 40% of utilization of emergency medical services (EMS) is estimated to be medically inappropriate, producing significant costs to healthcare systems. Public insurance status has been associated with a greater probability of EMS use, which may result from the absence of copayments for EMS use. However, the relationship between patients' EMS copay estimates and likelihood of EMS use is poorly understood.

Objectives: To determine the association between patients' cost perceptions and likelihood of inappropriate EMS use.

Methods: A random sample of patients and their health providers was performed at an urban adult emergency department. Patients were surveyed about their estimated EMS copay. A provider-centric determination of appropriate EMS use was obtained by asking providers if a patient's presenting condition warranted EMS transport. The association between patients' cost perceptions and likelihood of inappropriate EMS use was thus measured.

Results: 292 patients were enrolled, of whom 166 (57%) were rated as appropriate for use of EMS. Among these 166 patients, 101 (60%) used EMS. Among 126 patients rated as inappropriate for EMS, 42 (33%) used EMS, constituting 29% of total EMS use. Patients were less likely to utilize EMS if they estimated any copay above zero when their EMS use was inappropriate (28% vs. 52%, p<.05), but also if it was appropriate (55% vs. 73%, p<.05). Positive copay estimates were associated with the same number of decreased appropriate and inappropriate transports (n=30). Magnitude of copay estimate and availability of fewer transportation alternatives were not associated with decreases in inappropriate EMS use.

Conclusion: Nearly 1 in 3 EMS transports were inappropriate as defined by a healthcare provider. That patients with and without medically appropriate needs for EMS were less likely to use EMS when they believed they had a positive copay suggests that higher perceived out-of-pocket costs may discourage patients from calling an ambulance regardless of their emergency status. If the harm of decreasing an appropriate use of EMS is viewed as more concerning than the benefit of decreasing an unnecessary use of EMS, EMS copays may not be a desirable strategy to reduce inappropriate EMS use.

188 Do EMS Providers Accurately Ascertain Anticoagulant Use in Older Adults with Head Trauma?

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Background: Preinjury anticoagulant use in older adults increases the risk for acute traumatic intracranial hemorrhage. Field triage guidelines recommend transporting these patients to centers capable of rapid evaluation and treatment. The ability of EMS providers to accurately ascertain anticoagulant use in this population is unknown.

Objectives: We evaluated the reliability of EMS ascertainment of anticoagulant use in older adults with head trauma.

Methods: This was a countywide, retrospective study at 5 EMS agencies and 11 hospitals of patients 55 years or older who were transported to a hospital by EMS after head trauma from Jan 1, 2012 to Dec 31, 2012. We excluded patients with unmatched hospital data. Anticoagulant use in the following subgroups (warfarin, direct oral anticoagulants [dabigatran, rivaroxaban, apixaban], aspirin, and other antiplatelets [e.g., clopidogrel, ticagrelor]) were compared between EMS and ED/hospital providers. We calculated the percent agreement and kappa statistic for each subgroup. We evaluated if prehospital characteristics (EMS agency, ALS or BLS transport, level of EMS provider, English as a primary language, intoxication, or abnormal mental status [GCS score less than 15]) were associated with disagreement of warfarin use between EMS and ED/hospital providers using regression analysis.

Results: After excluding 174 (7.6%) patients with unmatched hospital data, 2,110 patients were included for analysis; median age was 73 years old (IQR 62-85 years) and 851 (40%) were male. Percent agreement and the kappa statistic of anticoagulant use between EMS and ED/hospital providers are reported in the Table. None of the prehospital variables evaluated were associated with disagreement of warfarin use between EMS and ED/hospital providers.

Conclusion: EMS and ED/hospital providers agreed on preinjury warfarin use whereas the direct oral anticoagulant, aspirin, and other antiplatelet subgroups had lower agreement. Prehospital characteristics do not appear to be associated with disagreement.

189 The Effect of Mechanical Ventilation of TBI Patients in the Prehospital Setting

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Background: Active management of ventilation in patients with traumatic brain injury (TBI) is thought to prevent hypoxia and reduce hyperventilation. Consistent breath-to-breath ventilation provided by a mechanical ventilator may result in more patients with eucapnea than manual bag-valve ventilation.

Objectives: To determine the incidence of hyper- and hypo-capnea in intubated patients with severe TBI in the prehospital setting and to

% agreement and kappa of EMS and ED/hospital anticoagulant use, n=2110

Subgroup	Use per EMS provider, n (%)	Percent agreement, n% (95%CI)	Kappa, % (95%CI)***
Warfarin use	123 (5.8%)	96.9% (96.1 to 97.6%)	0.76 (0.71 to 0.82)
Direct oral anticoagulant use*	7 (0.3%)	99.4% (99.0 to 99.7%)	0.45 (0.16 to 0.71)
Aspirin use	184 (8.7%)	84.4% 82.8 to 86.0%)	0.33 (0.28 to 0.39)
Other antiplatelet agents use**	59 (2.8%)	96.1% (95.2 to 96.9%)	0.51 (0.42 to 0.60)

*dabigatran, rivaroxaban, apixaban
**clopidogrel, tigacrelor, ticlodipine, prasugrel, dipyridamole, cilostazol
***> 0.6 to 0.8, substrantial agreement; >0.4 to 0.6, moderate agreement, >0.2 to 0.4, fair agreement

Table 188: Nishijima.

Table 1	Mechanical Ventilator Not Used (n=67)		Mechanical Ventilator Used (n=26)	
Age – mean (SD)	44	(20)	41	(18)
Caucasian – n (%)	59	(88.1)	22	(84.6)
Male – n (%)	49	(73.1)	21	(80.8)
Hypoxemia (any SpO2<90) – n (%)*	21	(33.9)	10	(38.5)
Injury Severity Score – mean (SD)	29	(12)	27	(11)
Administration of Hyperosmolar Fluid – n (%)	21	(31.3)	18	(69.2)
Capnography Use – n (%)	50	(74.6)	24	(92.3)
Flight Time (minutes) – mean (SD)	10.4	(4)	11.5	(4)
Hypocapnea – n (%)	3	(4.5)	1	(3.8)
Eucapnea – n (%)	24	(35.8)	9	(34.6)
Hypercapnea – n (%)	40	(59.7)	16	(61.5)

Table 189: Woods Curry.

test the hypothesis that eucapnea is more common in mechanically ventilated patients than manual bag ventilated patients.

Methods: This retrospective chart review enrolled intubated adults with severe TBI (Glasgow Coma Score < 9) transported by a physician-staffed helicopter from the scene of injury to a Level I Trauma Center between 2009 and 2014. Potential patients were identified from the transport electronic record using keywords of "scene flights", "trauma" and "intubated." The primary outcome was the first venous pCO2 obtained in the ED. Hypocapnea (pCO2 < 41 mmHg), eucapnea (pCO2 of 41-51 mmHg), and hypercapnea (pCO2 >51) were defined based on the normal range for the testing instrument. Fisher's Exact Test was used to test for differences in groups.

Results: Of 1, 070 patients screened, 106 met inclusion criteria, 13 were missing critical data and 93 were enrolled. Mean age was 43 (SD 20), 81 (87%) were Caucasian, and 70 (75%) were male. Mean Injury Severity Score was 29 (SD 12) and 31 (35%) had at least one incident of hypoxia. Hypocapnea occurred in 4% (95% CI 2% - 10%), eucapnea in 36% (95% CI 26% - 46%), and hypercapnea in 60% (95% CI 50% - 70%). Twenty six patients (28%) were mechanically ventilated. Demographic and injury characteristics were similar between groups (Table 1).There was no difference in the rate of eucapnea in the bag-valve group compared with the mechanically ventilated group (36% v 35%, p=1.000).

Conclusion: In this study, only 36% of patients arrived at the ED with eucapnea. The use of a mechanical transport ventilator did not increase the rate of eucapnea compared to bag-valve ventilation. Few patients were hypocapneic, indicating a low incidence of hyperventilation in physician-staffed helicopter transport which may limit generalizability of the results. This study provides a unique snapshot into the characteristics and ventilatory parameters of TBI patients transported by a highly skilled medical helicopter team.

190 Unstable Vital Signs Before Prehospital Rapid Sequence Intubation (RSI) are Associated with Post-RSI Cardiac Arrest

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Background: Cardiac arrest following rapid sequence intubation (RSI) has been identified in the prehospital environment; however, there is a paucity of research describing a relationship between patient's vital signs prior to RSI and cardiac arrest following prehospital rapid sequence intubation (pRSI).

Objectives: The objective of this study was to assess the relationship between unstable vital signs prior to pRSI and cardiac arrest following pRSI.

Methods: This retrospective observational study examined all Emergency Medical Service (EMS) calls in North Carolina where pRSI was performed from July 1, 2013 to June 30, 2014. Each occurrence of pRSI, performed by EMS, was reviewed for the subsequent presence of cardiac arrest, determined by cardiopulmonary resuscitation being performed. In accordance with state protocol, only calls where pRSI was performed on a patient >15 years old were included. Patient vital signs immediately preceding pRSI were analyzed including blood pressure, pulse, and pulse oximetry. Vital signs were considered unstable if the systolic blood pressure (SBP) was <90 mmHg, heart rate (HR) was <60 beats per minute (BPM) or ≥100 BPM, and/or the pulse oximetry (SpO2) was <90%. Analysis includes the calculation of descriptive statistics as well as univariate odds ratios (OR) and 95% confidence intervals (95%CI).

Results: During the study period there were 716 pRSI procedures performed. There were 24 (3.4%) instances where CPR followed the pRSI procedure. Large measures of effect and statistical significance were noted when examining the univariate relationship between cardiac arrest following pRSI and SBP<90mmHg prior to pRSI (OR: 8.47, 95% CI: 2.58-25.85), HR<60 prior to RSI (OR: 3.69, 95%CI: 1.02-10.89), and SpO2<90% prior to pRSI (OR: 3.42, 95%CI: 1.18-10.13). No statistically significant relationship was found between cardiac arrest and a pre-pRSI HR ≥100 BPM (OR: 0.78, 95%CI: 0.30-1.92).

Conclusion: This study found a significant association between cardiac arrest following pRSI and pre-procedure hypotension, bradycardia, and hypoxia. Future studies should further evaluate these findings after adjusting for important covariates.

191 Factors Predicting 30-Day Revisit Following Discharge from an Emergency Department Observation Unit

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Background: Revisits after discharge from the hospital are costly and may be avoidable. Determining the factors associated with an increased risk of return could be valuable in identifying and avoiding unexpected revisits.

Objectives: To determine the role of sociodemographics, frailty, and comorbidities in the risk for 30-day revisits after discharge from the observation unit (OU).

Methods: A convenience sample of adult OU patients were surveyed to assess their socioeconomic status, social habits, and frailty measured by the Katz Index. Comorbidities and demographic information were obtained from patient records. Patients were contacted by telephone 30 days after discharge to assess if they had returned to any ED or hospital unexpectedly. Comparisons were made between those with and without unexpected revisits within 30 days of discharge from the OU.

Results: Of the 307 surveyed patients, 112 (36%) were contacted by telephone. 18 (16%) had visited an ED, and 6 (5%) had an unexpected hospital admission (30-day revisit rate of 21%). Patients with revisits tended to be younger (49.7±14.3 vs 57.8±15.8 years, p=0.021). Those with 30-day revisits had lower median income by home zip code ($30669±12936 vs $39823±21948, p=0.012), but health insurance status, employment and education were similar. There was a trend toward more smokers in the revisit group (33% vs 17%, p=0.093), however alcohol and illicit drug use were similar. There were no differences in risk for frailty by Katz Index (21% vs 17%, p=0.765) or availability of home support (75% vs 74%). On discharge, fewer in the revisit group had a prearranged follow up appointment (53% vs 78%, p=0.010). The revisit group had more ED visits in the past 12 months (4.1±5.0 vs 2.5±3.3, p=0.054), although both groups had a similar number of recent hospitalizations. Those with revisits trended toward more surgical chief complaints (17% vs 6%, p=0.097), and there were fewer patients with >5 comorbidities in the revisit group (33% vs 63%, p=0.010).

Conclusion: Patients with unexpected, 30-day revisits were younger, had a lower median income by zip code, had more ED visits in the past year, were less likely to have a prearranged follow up appointment and were less likely to have >5 comorbidities. This suggests that sociodemographic factors and lack of primary care availability may play a large role in revisits following discharge from the OU.

192 Forecasting Emergency Department Patient Admissions Utilizing Machine Learning

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Background: Multiple studies have identified inpatient bed availability as a key metric for Emergency Department operational performance. Early planning for patient admissions may allow for optimization of hospital resources.

Objectives: Our study aimed to predict the need for admission at the time of patient triage utilizing data already available in the electronic health record (EHR). We performed a retrospective analysis of EHR derived data to evaluate the effectiveness of machine learning techniques in predicting the likelihood of admission for patient encounters in an academic emergency department. We hypothesized that more comprehensive & inclusive models would provide greater predictive power.

Methods: All patients who presented from 1/1/2012 to 12/31/2013 and met inclusion criteria were included in the analysis. The data were then partitioned into two sets for training and testing. The primary outcome measured was the ability of the trained models to discern the future admission status of an encounter, measured in terms of area under the receiver operator curve (ROC AUC). A secondary outcome was accuracy (ACC). Model features included a mix of patient specific factors (demographics, triage vital signs, visit and chief complaint history), the state of the ED (census and other performance metrics); and timing factors (time of day, etc.). The most comprehensive models included 682 variables, encoding 328 features, aggregated into 3 feature groups.

Results: Our final analysis included 91,060 patient encounters. 28,838 (31.7%) of these encounters resulted in an inpatient admission. Compared to using a naïve model, single feature group models provided improved predictive abilities (1.8% - 50.8% improvement in ROC AUC), see figure for details. More sophisticated models, including all available feature groups provided greater predictive power with the greatest achieved at ROC AUC score of 0.756.

Conclusion: We have demonstrated that including information about incoming patients and the state of the ED at the time of an triage can aid in the prediction of individual patients' likelihood of admission. More sophisticated models using claims, weather, and social media data may lead to greater predictive power to prospectively estimate patient admission likelihood at arrival.

Model (Feature Group)	ROC AUC	ACC
Naïve (All)	0.500	0.683
Logistic Regression (ED State)	0.509	0.505
Logistic Regression (History)	0.559	0.633
Logistic Regression (Patient Encounter)	0.754	0.754
Logistic Regression (All)	0.756	0.756

Table 192: Otles.

193 The Prevalence of Emergency Department Visits that are Potentially Treatable in Non-ED Settings

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Background: The care provided during some emergency department (ED) visits could potentially be provided in alternative care sites, including physician offices, retail clinics, and urgent care centers. Previous studies have relied on triage scores, chief complaints, or discharge diagnoses to identify these visits.

Objectives: To estimate the percentage of ED visits by adults aged 19 or older that could be potentially seen in alternative care sites using a novel classification scheme that links ED visit parameters (timing, resource utilization, severity of illness) with each site's opening hours and functional capabilities to deliver the same care (Figure, Table).

Methods: We conducted a cross-sectional analysis of the 2010 National Hospital Ambulatory Medical Care Survey (NHAMCS), a nationally representative sample of ED visits. Based on our classification scheme, we estimated the proportion of ED visits by adults aged 19 or older that could be substituted at physician offices, retail clinics, and urgent care centers. All analyses accounted for the complex survey design of the NHAMCS.

Results: The sample included 25,044 ED visits; 1,292 (4.9%) were excluded due to unclassifiable disposition (no disposition, other disposition, or left before triage) or missing data for arrival time or length of visit. After these exclusions, our sample included 25,004 ED visits, representing 93,886,670 adult ED visits in 2010. Based on severity of illness and functional capabilities only, 33.1%, 33.1%, and 79.7% of ED visits could potentially be substituted in physician offices, retail clinics, and urgent care centers, respectively. When we only included ED visits that began and ended during the typical opening hours for each site, these percentages decreased to 9.7%, 16.7%, and 36.1%, respectively.

Figure. Conceptual model of substitutability of ED visits in alternative care sites. In our model, functional capability refers to lab tests, imaging tests, and procedures. Non-severe illness is identified by patient disposition.

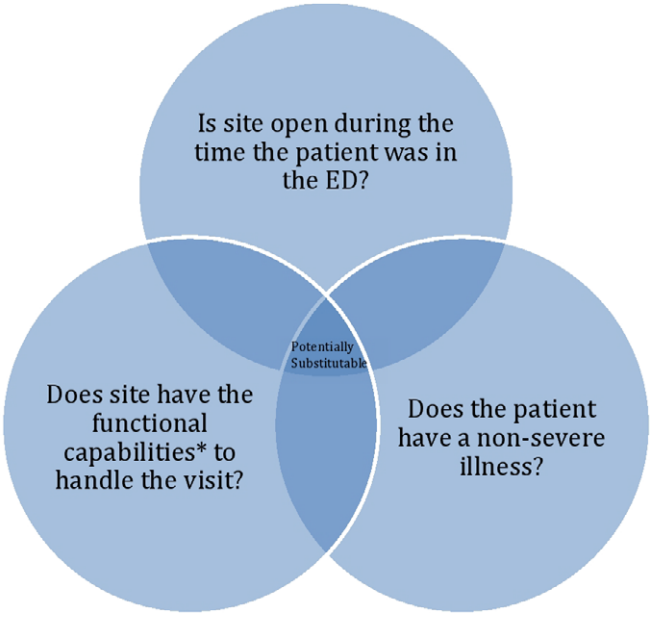

Table 1. Criteria for assessing potential substitutability of ED visits

		Physician office	Retail clinic Retail clinic	Urgent care center
Opening hours	Extended hours a	N	Y	Y
Functional capabilities	Basic lab tests b	Y	Y	Y
	Advanced lab tests c	N	N	Y
	Basic imaging d	Y	Y	Y
	Advanced imaging e	N	N	Y
	Basic procedures f	Y	Y	Y
	Advanced procedures g	N	N	Y
Severity of illness	High severity h	N	N	N

[a]Extended hours are defined as weekdays from 9 am to 9 pm, Saturday 9 am to 5 pm, and Sunday 9 am to 5 pm; basic hours are defined as weekdays from 9 am to 6 pm. We considered an ED visit to be potentially substitutable based on timing if the ED visit began and ended during the alternative care site's opening hours.
[b]Complete blood count, blood urea nitrogen/creatinine, electrolytes, glucose, liver function tests, coagulation tests, blood culture, electrocardiogram, human immunodeficiency virus test, influenza test, pregnancy test, toxicology screen, urine test, wound culture
[c]Cardiac enzymes, arterial blood gas, blood alcohol level, cardiac monitoring, other blood tests, other lab test
[d]X-ray[e]Computed tomography, magnetic resonance imaging, ultrasound, other imaging
[f]Splint, pelvic exam, nebulizer therapy
[g]Intravenous fluids, casting, suturing, incision and drainage, foreign body removal, bladder catheterization, other procedure
[h]High severity is indicated by the following patient dispositions: admit to hospital, observation then admission, observation then discharge, transfer to psychiatric hospital, transfer to other hospital, died in emergency department, dead on arrival

Conclusion: Similar services are potentially available in alternative care sites at the same time that many U.S. ED visits occur. As payment reform focuses on reducing the volume of hospital-based care, considerable numbers of ED patients could potentially be cared for in non-ED settings if sufficient capacity exists to handle the demands and ensure quality.

194 Asymptomatic Hypertension in Urban EDs: Where Are We Now?

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Background: Asymptomatic hypertension (HTN) occurs at higher rates in the emergency department (ED) (44%) compared to the general population (27%), disproportionately affecting Blacks and the elderly. The American College of Emergency Physicians (ACEP) recommends referral to primary care for HTN confirmation/management; however, adherence to this guideline is suboptimal.

Objectives: The purpose for this study was to examine the prevalence of asymptomatic HTN; rate of BP reassessment and referral, and factors associated with it among adult patients who visit the ED and who were discharged, a decade after this policy was disseminated.

Methods: A retrospective review for all ED encounters was performed over two weeks in each calendar quarter (September, January, April, and July) for the study period 2014-2015. All patients whose initial systolic BP was ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg and who were discharged from the ED were included in the sampling frame.

Results: 1,184 patients had asymptomatic HTN. Mean initial BP was 170/88 mmHg. A greater proportion of patients with asymptomatic HTN were male (51.3%), Black (43.2%) (p<.000), middle aged (μ 50.2 ±16), had Medicaid (39.8%), had some pain (70%) and presented for a non-urgent complaint (59.2%). A large proportion (94.2%) had no CVDs, in which only 6.7% were previously diagnosed with HTN. 49% of patients had their BP reassessed (μ 158/88 mmHg) and these patients were more likely to have no CVDs and be middle aged. 4.6% (n=28) of patients were referred and were more likely to be are middle aged, have some pain, and have no CVDs. 100% of these patients sought primary care at our facility and adhered to the ED provider recommendations.

Conclusion: Despite a decade since the ACEP policy was disseminated, reassessment and referral rates remain low. Incidental findings of HTN occur frequently in the ED, especially in Black middle aged persons of lower socio-economic status. ED providers may have the potential to reduce the detrimental effects of having undiagnosed or under-treated HTN by acting on missed opportunities during the ED visit.

195 Feasibility Analysis of Emergency Department Key Performance Indicators in Ireland: Final Analysis

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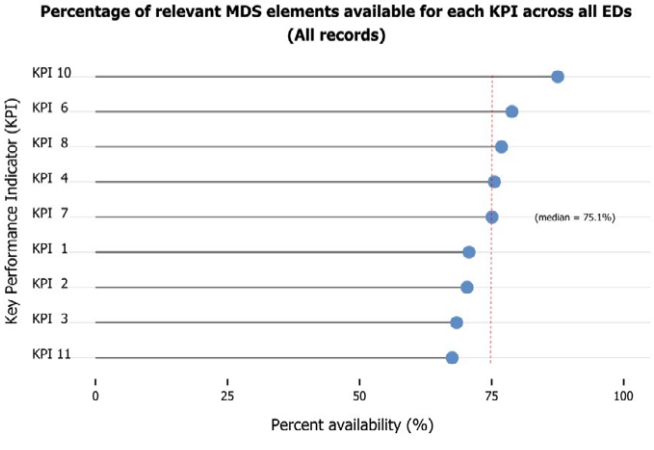
Background: Despite its limitations, use of medical records as a data source for performance indicators is common.

Objectives: To measure the completeness (availability) of ED medical records as a source of minimum data set (MDS) elements for a feasibility analysis of 10 ED key performance indicators (KPIs) in Ireland.

Methods: MDS elements relevant to the following 10 ED KPIs were studied in a variable number of EDs: time to analgesia in adults presenting with abdominal pain (KPI 1; 11 EDs), time to analgesia in children presenting with abdominal pain (KPI 2; 7 EDs), time to analgesia in children with a suspected forearm fracture (KPI 3; 7 EDs), time to antibiotics in adults with sepsis (KPI 4; 11 EDs), time to antibiotics in children with suspected bacterial meningitis (KPI 5; 1 Pediatric ED), time from ED arrival to first ECG in adults with suspected cardiac chest pain (KPI 6; 11 EDs), time to brain CT in

Figure 1. Percentage of relevant MDS elements available for each KPI across all EDs



patients presenting within 4.5 hours of onset of symptoms consistent with a stroke (KPI 7; 10 EDs), total ED time (KPI 8; 12 EDs), unplanned ED re-attendance rate within 7 days of original attendance (KPI 10; 12 EDs) and left before completion of treatment (LBCT) rate (KPI 11; 12 EDs). Two investigators in each of the 12 participating EDs independently abstracted the relevant MDS elements. Reproducibility of the data abstraction process was measured by using inter-observer and intra-observer agreement (kappa scores).

Results: Overall 105,982 MDS elements relevant to the 10 KPIs were collected and analyzed from 9,298 patient records in 12 EDs. The proportion of MDS elements available for each KPI examined ranged from 66.53% to 87.51% (Figure 1). The median inter-observer kappa value ranged from 0.56 to 0.81. The median intra-observer kappa value ranged from 0.78 to 0.91.

Conclusion: Many MDS elements examined are absent in medical records. This highlights the importance of performing a feasibility analysis before implementing KPIs based on using medical records as a data source.

196 Death in the Emergency Department: National Trends Over 15 Years

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Background: While the core mission of emergency medicine is to provide immediate care to acutely ill and injured patients, the emergency department (ED) is also often where end-of-life care occurs. Recent efforts in palliative and pre-hospital care have sought to shift the locus of death, when feasible, to non-emergent settings. Meanwhile, recent advances in acute care have sought to decrease mortality from immediately life-threatening conditions.

Objectives: To assess trends in US ED mortality rates over 15 years.

Methods: We examined national trends in adult ED mortality by analyzing the National Hospital Ambulatory Medical Care Survey from 1997 to 2011. All adult ED visits during this period were included, resulting in 367,618 visits representing over 1.3 billion weighted visits. The main outcome was annual ED mortality per 1,000 U.S. population. To evaluate longitudinal changes, we performed survey-weighted trend analysis using weighted least squares regression. We also analyzed inpatient hospital mortality between 2005 (when this data became available) and 2011, as well as patient demographic and "reason for visit" data associated with ED mortality.

Results: Compared to patients who survived, those who suffered ED death were on average older, male, white, and had more severe triage acuity ($p<0.001$). ED mortality rate decreased from 1.48 per 1,000 in 1997 to 0.77 per 1,000 in 2011 ($p<0.01$ for trend), whereas there was no significant change in inpatient mortality (Figure). Patients were noted to be in cardiopulmonary arrest, unconscious, or dead on arrival for the majority of visits (62.7%) associated with ED death. Shortness of breath (8.3%), injury (5.1%), and chest pain (3.9%) were the most common presenting reasons for the remaining patients who suffered ED death.

Conclusion: There was a nearly 50% drop in ED mortality between 1997 and 2011. The underlying etiology is likely multi-factorial, and may be related to advances in palliative, pre-hospital, and critical care, but further research is needed to delineate the causative factors.

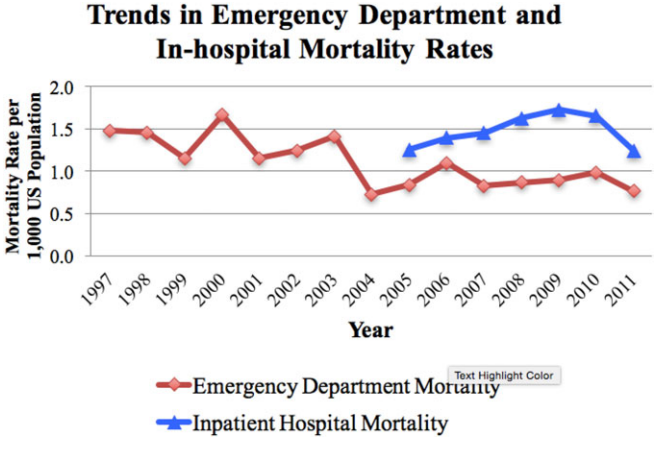

Figure 196 – Kanzaria

197 Sonographically Measured Diaphragmatic Thickening Ratio is Predicted by Demographic Parameters and Vital Signs in Healthy Teenagers and Young Adults

Gabriel Rose, Rachel Berkowitz, Sebastian D. Siadecki, Noah Delone, and Turandot Saul
Mount Sinai School of Medicine, New York, NY

Background: Emergency physicians (EPs) often rely on subjective measures such as patient-reported symptoms or clinical judgment in patients with acute respiratory complaints. Ultrasound has been used to study diaphragm excursion (DE) and thickening (DT), with findings correlated to lung plethysmography and PFTs. The use of bedside ultrasound to establish normative values has not been studied in the emergency department (ED).

Objectives: The objective of this study is to measure DE and DT in healthy teenagers and young adults to establish baseline normal ranges for use in future studies on patients with respiratory illness.

Methods: This was a prospective observational convenience sample of stable ED patients ages 14-45 without a history or complaint of respiratory illness. Patient demographics and vital signs were collected. Each test subject was evaluated over the course of three respiratory cycles. DE was measured using M-mode during quiet breathing (resting tidal volume [Vt]) and during forced inspiratory capacity (IC). DT was measured in B-mode at maximal expiration (FRC) and again during IC. Each measurement was performed three times and the values averaged. The diaphragm thickening ratio (DTR) was then calculated as (DT at IC) - (DT at FRC) / (DT at FRC). Descriptive statistics were used to summarize results and multiple linear regression analysis was used to correlate demographics and vital signs with DTR.

Results: 29 patients have been enrolled. 5 were unable to complete the study protocol leaving 24 patients for analysis. The average age was 29.46 years (SD = 8.14), average height was 171.1 cm (SD = 11.46), and average weight was 78.81 kg (SD = 21.34). The average O_2Sat was 98.6% (SD = 0.012). The mean DE during Vt was 1.32 cm (SD = 0.42) and during FVC it was 5.33 cm (SD = 1.22). The mean DT at FRC was 0.22 cm (SD = 0.07) and the mean DT at IC was 0.37 cm (SD = 0.14). The mean DTR was 0.70 (SD = 0.47). Height ($p=0.034$), weight ($p=0.034$), temperature ($p<0.001$), and O_2Sat ($p=0.011$) were found to be statistically significant variables in predicting DTR at the 95% confidence level.

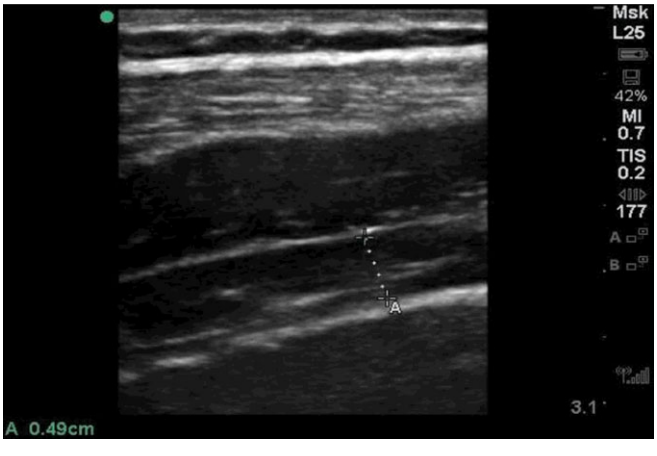

Figure 197 – Rose

Conclusion: Bedside ultrasound can be used in the ED to measure both DE and DTR in healthy subjects. This data will reveal baseline normative values, which can be used for future comparison in the evaluation of patients with respiratory complaints.

198 Feasibility of Pneumoperitoneum Diagnosis Using Point-of-Care Ultrasound: A Pilot Study Using a Fresh Cadaver Model.

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[1]*Hartford Hospital, University of Connecticut School of Medicine, CT;* [2]*Inova Alexandria Hospital, Alexandria, VA;* [3]*Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA*

Background: Emergency Ultrasound (EUS) is an established bedside imaging tool, frequently used in patients with acute abdominal pain. Investigations by non-emergency physician (EP) imaging experts have shown that ultrasound reliably detects less than 1cc of free intraperitoneal air in trauma and medical patients, diagnosing perforated viscous. There is no knowledge if trained EPs can reliably detect small amounts of free air with EUS.

Objectives: This prospective, randomized trial assessed the accuracy of 2 trained and blinded EPs in detecting small amounts of free intraperitoneal air using a fresh human cadaver model.

Methods: Trained research assistants injected 15 fresh human cadavers on 3 occasions with various predefined quantities of free intraperitoneal air of 0.25-10cc or sham injections of 0cc. Seven cadavers were injected into the mid-epigastrium (ME), while 8 were injected into the left lower quadrant (LLQ) (Figure 1). Each cadaver was scanned after each of the 3 injections by 2 trained and blinded EPs, resulting in 45 scans per sonographer. Scans were performed via validated and standardized techniques.

Results: Free air (0.25-10cc) injected into the ME was successfully diagnosed and documented in 36 of 42 instances (86% sensitivity), but was not detected in 26 of 36 instances when injected into the LLQ (28% sensitivity). Notably, both EPs correctly diagnosed and documented all 10 separate air injections of ≥2 cc into the ME. There was no obvious benefit of performing multiple scans on a single cadaver, as success rates were comparable after the 1, 2 and 3 injections in both ME (90, 88 and 81%) and LLQ (50, 14 and 29%). Sonographer 2 more frequently provided a correct diagnosis and documentation of air injected into the ME (95 vs. 76%) or the LLQ (39 vs. 17%), but generated 3 false positive diagnoses vs. 1 from Sonographer 1.

Conclusion: Trained EPs detected small amounts of free air ≥2 cc reliably when injected into the ME in this human cadaver model. With further research, detection of pneumoperitoneum may become a future indication for EPs trained in EUS.

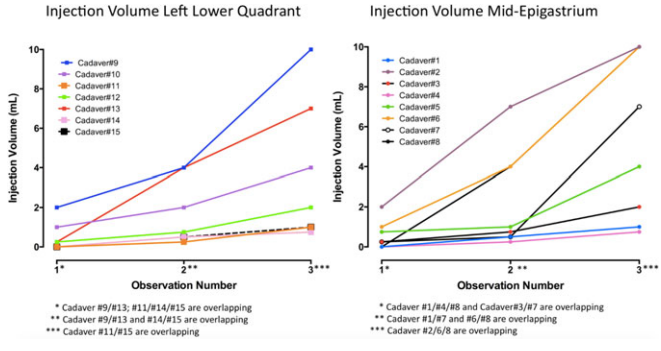

Figure 198 – Herbst

199 Sidedness and the Effect of Respiration on the Measured Corrected Flow Time of the Carotid Arteries

Michael Doctor, Sebastian D. Siadecki, Denrick Cooper, Gabriel Rose, Aaran B. Drake, Melvin Ku, and Turandot Saul
Mount Sinai St. Luke's-Roosevelt Hospital Center, New York, NY

Background: Critically ill patients are among the most resource demanding, often requiring large volumes of IV fluids. The ideal volume of fluid to administer should be individualized for each patient to increase blood pressure and perfusion, but titrated to avoid complications such as pulmonary edema. Fluid responsiveness, a 10-

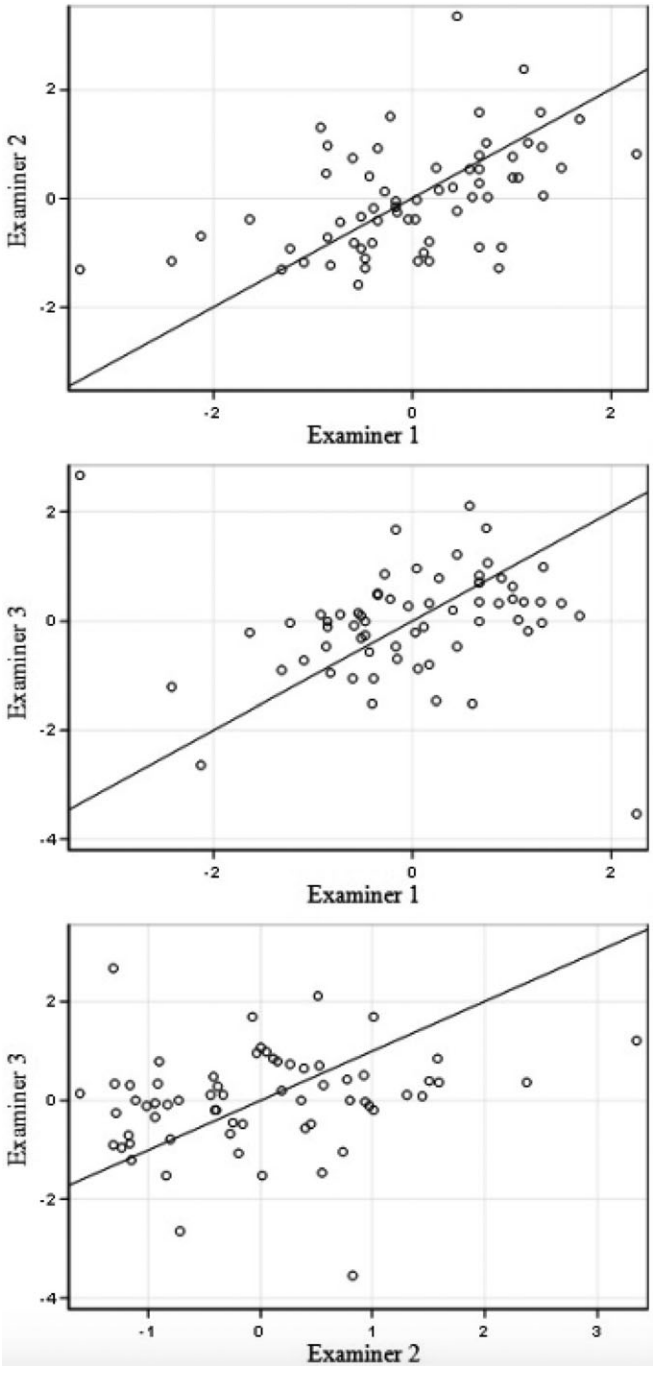

Figure 199 – Doctor

Reliability and reproducibility coefficients of cFT by side and respiratory phase		
	Reliability Coefficient	Reproducibility Coefficient
Left/Inspiration	0.05	0.50
Right/Inspiration	0.07	0.48
Left/Expiration	0.12	0.34
Right/Expiration	0	0

Table 199: Doctor.

15% increase in cardiac output following a fluid bolus, has been assessed by multiple methods, however the ideal technique has not yet been agreed upon. Previous studies have assessed the effectiveness of carotid artery corrected flow time (cFT) as an assessment of fluid responsiveness with ease and promising results. Cardiac output is known to change with the respiratory cycle as intra-thoracic pressures change. In addition, anatomical differences exist between the right and left carotid arteries. Therefore, serial exams of cFT may be subject to variation at different points during the respiratory cycle or from one side to the other.

Objectives: We investigated the reliability and reproducibility of cFT measurements between three sonographers at various phases of the respiratory cycle and between the left and right common carotid arteries.

Methods: Subjects were asked to lie supine during examination of their cFT. Measurements were taken of the right and left carotid arteries five seconds after both full inspiration and full expiration. The scan protocol was repeated by two other sonographers blinded to the previous results. Agreement between sonographers was expressed through descriptive measures of reliability. The degree of reproducibility was expressed through descriptive measures of reproducibility.

Results: Bland-Altman plots are shown in Figure 1. Reliability and reproducibility coefficients are in Table 1. Both were poor throughout the study. Independent of sonographer, there was no significant difference in cFT measurements between side (p=.93) or respiration (p=.29).

Conclusion: cFT can be easily measured and does not require the technique of obtaining quality cardiac views and is not subject to variability from angle of insonation like Doppler analysis. In this study, reliability and reproducibility were poor making cFT likely inadequate for clinical use. There were no significant differences in measured cFT between the right and left carotid arteries, or between respiratory phases.

200 The Waterfall Sign: A Novel Technique to Quantify BLines on M-Mode Ultrasound

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Background: The ultrasound (US) diagnosis of diffuse alveolar interstitial syndromes (AIS) is based on visualizing 3 or more BLines in at least two of four lung zones on each side of the chest. BLines are hyperechoic vertical lines sliding from the pleura to a depth of at least 18 cm. The quantification of BLines remains subjective with respect to the length of time viewed. M-Mode, where motion is displayed relative to time, may improve the objective quantification of BLines.

Objectives: The purpose of this preliminary investigation is to describe the M-Mode "Waterfall Sign" of BLines in critically ill patients with diffuse AIS.

Methods: A convenience sample of 33 intensive care unit patients were recruited as a part of an ongoing hemodynamics study. Using a convex probe, two intensivists with advanced US training, assessed for BLines first with a 4 second B-Mode video, then with an M-Mode still including 4 seconds. B-Mode videos were immediately rated as A profile (no Blines), B profile (<3 Blines) or B+ profile (≥3 Blines). An emergency US director independently later reviewed only M-Mode images and applied the same A, B, or B+ rating.

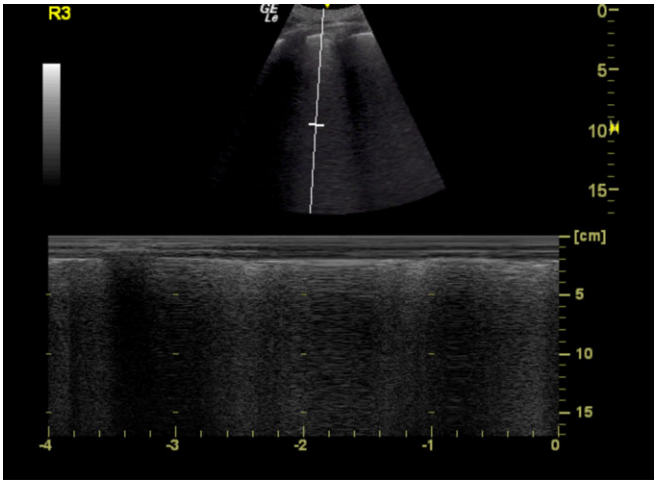

Figure 200 – Nakitende

Results: In patients with a B+ profile suggestive of AIS, M-Mode consistently demonstrated one or more hyperechoic "Waterfall Sign" bands from the pleural line to the far field. An increasing number and width of BLines on B-Mode corresponded with the number and thickness of the "Waterfall Sign" bands on M-Mode. The single M-Mode still image provided a convenient and straightforward method to document the number and intensity of BLines seen during a 4 second B-Mode video. Among 182 quadrants assessed overall agreement was 89%. Among 55 lung quadrants with B+ profile alone, agreement between B-Mode and M-Mode overall for B+ lines was 82%

Conclusion: The "Waterfall Sign" on a single M-Mode image may provide a more easily recognized and objective quantification of BLines seen on B-Mode video loops. Reducing subjectivity may shorten the learning curve for new operators and facilitate image transmission for quality assurance. Comparison of both M-Mode and B-Mode separately to an independent reference standard across a spectrum of disease severity will further clarify accuracy.

201 Emergency Physicians are Able to Detect Right Ventricular Dysfunction

Matt Rutz, and Frances M. Russell
Indiana University School of Medicine, Indianapolis, IN

Background: Bedside echocardiography has become a vital tool in evaluating patients presenting to the emergency department (ED) with acute dyspnea. Right ventricular (RV) dysfunction on echocardiography is associated with repeat hospitalizations and shorter life expectancy.

Objectives: While traditionally RV assessment has been evaluated by cardiology, the goal of this study was to determine if emergency physicians (EPs) could accurately detect RV dysfunction.

Methods: We conducted a prospective observational study on a convenience sample of adult ED patients with acute dyspnea and negative CT angiography. All patients had an EP-performed bedside echocardiogram to assess for RV dysfunction. RV dysfunction was defined as RV dilation (RV:LV ratio greater than 1) and/or moderate to severe tricuspid regurgitation (TR). Scans were performed by both experienced and novice sonographers. A cardiologist interpretation, blinded to patient information and EP's interpretations, served as the criterion standard.

Results: A total of 71 patients were enrolled, 14% had RV dysfunction. Sensitivity and specificity of EP-performed echocardiography for RV dysfunction were 90% (95% CI 0.6-0.98) and 85% (95% CI 0.72-0.93), respectively. Agreement between EPs and cardiology was assessed using kappa. For overall RV dysfunction, κ = 0.63 (95% CI 0.39-0.87). For RV dilation, κ = 0.61 (95% CI 0.36-0.84). For moderate to severe TR, κ = 0.59 (95% CI 0.32-0.85).

Conclusion: EP sonographers, both novice and experts, are able to detect RV dysfunction with good agreement when compared to cardiology. These results support the wider use of EP-performed bedside echocardiography to evaluate for RV dysfunction in dyspneic ED patients.

202 Computerized Detection of Abdominal Free Fluid in FAST Exams—A Pilot Study

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[1]*Boston Medical Center, Boston, MA;* [2]*Boston University School of Medicine, Boston, MA;* [3]*BioSensics, LLC, Cambridge, MA*

Background: The Focused Abdominal Sonography for Trauma (FAST) exam is an ultrasound exam used within emergency and critical care to detect free fluid in the setting of trauma. Interpretation of the FAST exam can be limited by operator experience. There may be a role for automated, computerized interpretation to assist those operators with minimal training.

Objectives: This pilot study tests the feasibility of automating the detection of free fluid in a FAST exam using image segmentation, feature selection, and machine learning.

Methods: Using an emergency ultrasound database, ten positive and ten negative RUQ FAST exam videos from adult patients were randomly selected. Image segmentation identified hypoechoic regions of interest (ROI). Emergency physicians trained in ultrasound manually classified all hypoechoic ROI as free fluid or not. Six geometric properties and eight grayscale color properties of the shapes and their surroundings were computed. The stages of image segmentation for four exemplary cases are shown in Figure 1. These features were normalized and used as inputs to a radial basis function Support Vector Machine (SVM) classifier. A ten-fold cross validation assessed the sensitivity and specificity as compared to manual classification.

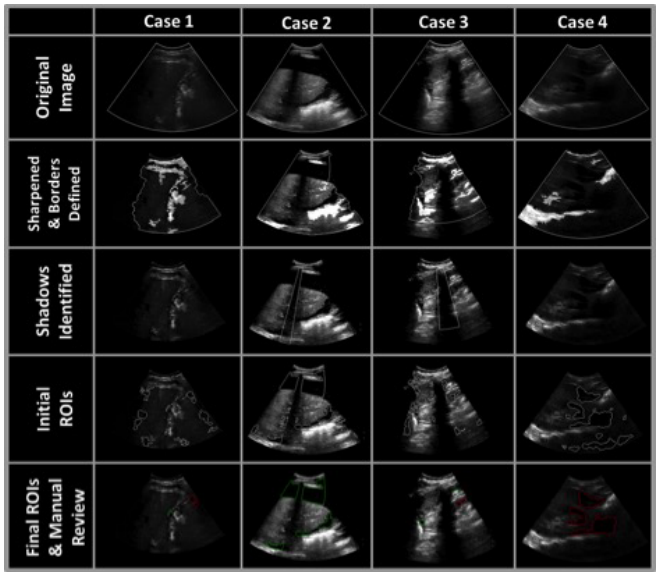

Figure 202 – Sjogren

Classification Results by Video for the SVM Classifier			
Actual		-	
Positive	Negative		
10	1	Positive	Predicted
0	9	Negative	

Table 202: Sjogren.

Results: On a shape-by-shape basis, sensitivity and specificity of the SVM was 66.1% and 99.5%, respectively. On a frame-by-frame basis the sensitivity and specificity was 74.9% and 98.6%, respectively. On a video-by-video basis the sensitivity and specificity was 100% and 90%, respectively (Table 1).

Conclusion: This pilot study demonstrates the feasibility of developing a computer program that would automate the detection free fluid in the FAST exam. This technology could be expanded to all quadrants of the FAST exam. Much like the automated EKG read, this technology could assist providers in FAST interpretations and have a profound impact on patient care.

203 Reduced Mortality of Emergency Department Patients with Early Sepsis Stages After Achievement of All Performance Measures of a Quality Improvement Program

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Leiden University Medical Centre, Leiden, Netherlands

Background: Quality improvement programs focus on severe sepsis, while they may exert more benefit in emergency department (ED) patients with a suspected infection *without* acute organ failure, in whom progression to severe sepsis can still be prevented.

Objectives: We investigated the impact of achievement of performance measures (PM) on mortality in ED patients with early sepsis stages.

Methods: This was a prospective observational study in two Dutch hospitals. Consecutive hospitalized ED patients with a suspected infection *with* and *without* acute organ failure were included. Based on the PIRO (Predisposition, Infection, Response and Organ failure) score, patients were classified in low (PIRO 0-8), intermediate (PIRO 9-17) and high (PIRO ≥18) disease severity categories. In-hospital mortality (primary outcome) was subsequently compared in two groups: The full compliance (*all* PM achieved) and the *no* full compliance (not all PM achieved) group.

Results: Achievement of *all* PM (N=719 (41.5%) of 1732) was an independent predictor of mortality with a corrected odds ratio (OR) of 0.30 (95%-CI, 0.19 to 0.47), as assessed by multi-variable logistic regression analysis. The PMs "appropriateness of initial antibiotics" (OR 0.51 (0.33 to 0.80), "correctness of ED diagnosis" (OR 0.39 (0.24 to 0.64) and "no unanticipated transfer from ward to ICU" (0.17 (0.1-0.3) had the largest impact. In low-risk patients, mortality was similar in the groups with and without full compliance. In contrast, intermediate-risk patients had a 5.3% (3.1 to 7.5) mortality in the full compliance group, lower than 13.8% (12.3 to 15.4) in the group without full compliance (P<0.001). In high-risk patients, mortality was 10.3% (4.7 to16.0) and 32.8% (26.9 to 38.7) in the full versus no full compliance group, respectively (*P*=0.018).In the 1379 (80%) of 1732 patients *without* acute organ failure the overall relative mortality reduction achieved in the group *with* full compliance was 58.1%, while 44.7% (34 of 76) of the absolute sepsis-related mortality reduction was achieved in these patients.

Conclusion: Achievement of all PMs is associated with a reduction of in-hospital mortality in ED patients with a suspected infection *without* acute onset organ failure. Quality improvement programs should incorporate recommendations for ED patients with earlier sepsis stages.

204 Silent No Longer: Sepsis Recognition by Electronic Screening in the Emergency Department

Brian R. Sharp, Cassandra A. Schandel, Iris Vuong, Meredith Masters, Andrew Lee, Jeff Pothof, Azita Hamedani, and Michael Pulia

University of Wisconsin School of Medicine and Public Health, Madison, WI

Background: Early identification and treatment of sepsis has been shown to improve patient outcomes. Multiple organizations have recommended screening every ED patient for sepsis. Our institution recently adopted an electronic health record (EHR) based sepsis screen and alert.

Objectives: To assess the ability of an automated EHR based sepsis screening to accurately identify sepsis and/or severe sepsis/septic shock.

Methods: Our EHR based ED sepsis screen includes nurse screening questions and vital signs (temperature, heart rate, respiratory rate, blood pressure, oxygen saturation). The two ways to trigger alert for potential sepsis are: 1) Abnormal temperature plus an additional abnormal vital sign or 2) One positive nurse triage question and any two abnormal vital signs. The alert notifies both physicians and nurses and prompts ordering of basic labs, lactate, and a fluid bolus. A retrospective chart review was performed on a sample population of adult ED patients with SIRS criteria (2 or more abnormal vitals) randomly selected from the months of 9/2014 -12/2014 (after the initiation of the EHR sepsis screen in 7/2014). Two blinded chart reviewers categorized patients as no sepsis, sepsis, severe sepsis, or septic shock. A third party was used for tiebreaker reviews as needed.

Results: 1108 patient encounters were reviewed with 307 patients determined to have sepsis (kappa=.84) and 99 as severe sepsis or septic shock (kappa=.87). The screen demonstrated a sensitivity of 79.1% [95% CI 74.1-83.5] and specificity of 81.5% [95%CI 78.6-84.1], positive predictive value of 62.1% [95%CI 57.1-66.9], and a negative predictive value of 91% [95%CI 88.7-93.0]. For severe sepsis/septic shock, sensitivity was 73.7% [95%CI 63.8-81.8], specificity 68.5% [95%CI 65.5-71.3], positive predictive value of 18.6% [95%CI 15.0-23.0], and negative predictive value of 96.3% [95%CI 94.7-97.6].

Conclusion: Our specific sepsis-screening algorithm performed with balanced sensitivity and specificity and higher sensitivity and specificity for sepsis than severe sepsis/septic shock. Electronic screening can be an effective tool with the need to continue looking at balancing the sensitivity to detect sepsis and the specificity to prevent alarm fatigue.

205 Implementation of an Electronic ED Sepsis Screen and Alert: Effect on Compliance with ED Sepsis Quality Measures

Brian R. Sharp, Cassandra Schandel, Irish Vuong, Meredith Masters, Andrew Lee, Jeff Pothof, Azita Hamedani, and Michael Pulia
University of Wisconsin School of Medicine and Public Health, Madison, WI

Background: CMS recently started collection of sepsis quality measures (IV fluids, antibiotic administration, and lactate measurement within the first three hours of care). There is tremendous interest in electronic health record (EHR) based sepsis screening programs yet there is a paucity of published data regarding their efficacy.

Objectives: Our hypothesis was that an EHR sepsis screen and alert would improve compliance with time sensitive sepsis measures in the ED.

Methods: Our ED EHR sepsis screen combines nurse assessment with abnormal vital signs. When criteria are met, an alert triggers, prompting use of a sepsis order set (including serum lactate, IV fluid bolus, and antibiotics). We performed chart review on adult ED patients with SIRS criteria pre-implementation (9/13 to 12/13) and post-implementation (9/14 to 12/14) who by vital signs alone met criteria for our alert (nurse screening questions were not present pre-alert) and had ICD-9 codes of sepsis, severe sepsis or septic shock. Fisher's exact test was used for comparisons.

Results: 656 patient encounters were reviewed: 337 before and 400 after alert implementation. In the pre-alert period, 55 patients were determined to have sepsis and 34 with severe sepsis/septic shock. In the post-alert period, 62 patients with sepsis alerts were determined to have sepsis and 32 with severe sepsis/septic shock. When comparing pre- and post-implementation periods, for patients with sepsis, the following metrics were met within three hours: IV fluids 67% (37/55) vs. 87% (54/62) (p=.014); lactate drawn 78% (43/55) vs. 94% (58/62) (p=.029); and antibiotics 76% (42/55) vs. 91% (57/62) (p=.023). For patients with severe sepsis/septic shock the following metrics were met within three hours: IV fluids 79% (27/32) vs. 88% (28/32) (p=1); lactate obtained 85% (29/34) vs. 97% (31/32) (p=.12); and antibiotics 85% (29/34) vs. 97% (31/32) (p=.12).

Conclusion: Compliance with the new CMS sepsis measures improved following implementation of an EHR sepsis alert in patients with sepsis. Baseline compliance with these measures was high in our ED for severe sepsis/septic shock and observed improvements failed to achieve significance. EHR alerts have potential to improve compliance with the new CMS sepsis measures.

206 Neurologic and Hemodynamic Outcomes in a Head Up Versus Supine CPR Survival Model of Porcine Cardiac Arrest

Johanna C. Moore[1], Hyun Ho Ryu[2], Aaron Robinson[1], Michael Lick[3], and Keith G. Lurie[1]
[1]Hennepin County Medical Center, Minneapolis, MN; [2]School of Medicine, Chonnam National University, Gwangju, Korea, Republic of; [3]Minneapolis Medical Research Foundation, Minneapolis, MN

Background: Previous porcine studies have shown improved hemodynamic parameters, including cerebral perfusion pressure, in a head up (HUP) CPR model. We examined the impact of automated active compression decompression CPR with an impedance threshold device (ACD+ITD CPR) comparing HUP to the supine (SUP) position.

Objectives: To determine if 24 hour survival with favorable neurologic outcome as determined by cerebral performance category (CPC) differs between HUP and SUP groups.

Methods: Pigs were sedated, intubated, and anesthetized. Vascular access for hemodynamics was obtained. Ventricular fibrillation was induced and left untreated for 12 minutes. ACD+ITD CPR was performed at rate of 30:2 for 1.5 minutes, at which time randomization occurred to HUP or SUP, then 6.5 minutes of ACD+ITD CPR was performed. At 7.25 minutes epinephrine was administered and defibrillation was performed 1 minute later. Survivors were cooled intravascularly to 33° C for 4 hours. Post rewarming, pigs were extubated and observed. A blinded veterinarian assigned a CPC and Neurologic Deficit Score (NDS) at 24 hours. Sample size was calculated based upon an anticipated survival of 35% for SUP pigs and 80% for HUP pigs; an estimated 15 animals/group for the study aim would be required. Means are presented with standard error of the mean.

Results: To date in this ongoing study, 21 pigs were studied: 8/12 survived to 24 hours in the HUP group and 6/9 in the SUP group. In the HUP group, 6 had a CPC≤2 at 24 hours versus 3 in the SUP group. The mean 24 hour CPC score of survivors was 1.6±0.3 for HUP versus 2.5±0.6 SUP, and mean NDS score for HUP was 44±22 versus 88±45 for SUP. For the SUP pigs, hemodynamics for all after 7 minutes of CPR were as follows in mmHg: Mean arterial pressure (MAP) 34±2, sBP 41.1±2, systolic right atrial pressure (sRAP) 29±2, diastolic right atrial pressure (DRAP) 7±1, end tidal CO_2 27±3 and coronary perfusion pressure (CPP) 17±1. For the HUP pigs, findings at 7 min were MAP 39±2, sBP 51±3, sRAP 38±4, DRAP 5±1, end tidal CO_2 30±2, and CPP 22±2.

Conclusion: Hemodynamic parameter results to date appear to be consistent with prior head up CPR studies, with a trend towards higher rates of intact neurological survival at 24 hours in the HUP group. Further enrollment is needed before drawing definitive conclusions.

207 Does Use of a Sepsis Order Set Contribute to Unwarranted Antibiotic Utilization?

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Maine Medical Center, Portland, ME

Background: Antibiotic stewardship is an important consideration for emergency physicians. Efficient sepsis management including early antibiotic administration improves outcomes; however, there are potential adverse effects of antibiotics for both the patient (allergic reaction, side effects, C. *difficile*) and the community (multi-drug resistant organisms). While evidence supports bundled sepsis management approaches that include broad-spectrum antibiotics, there is concern that their use may contribute to unwarranted antibiotic use.

Objectives: We sought to determine the incidence of unwarranted antibiotic administration in adult ED patients with suspected sepsis following implementation of an electronic sepsis bundle that included broad-spectrum antibiotic recommendations.

Methods: This retrospective cohort study examined patient-level data extracted from our electronic record for a 3 month period from November 2014-January 2015. Adult ED patients who had an electronic sepsis bundle utilized and who received antibiotics within 3 hours of presentation were identified. Each case was manually reviewed and adjudicated for antibiotic appropriateness based on discharge diagnosis. Cases were classified as either: (1) evidence supported the use of antibiotics (2) evidence suggested that use of antibiotics was unwarranted or (3) indeterminate.

Results: During the study period, our sepsis bundle was utilized in 547 patients, of which 467 (85%) received broad-spectrum antibiotics within 3 hours of presentation. Sepsis bundle utilization ranged from 75-89% in our severe sepsis population (DRG 871) with median diagnosis to antibiotic administration times ranging from 25-44 minutes. Review of this subset revealed that 406 cases (87%) included evidence supporting the use of antibiotics, 58 cases (12%) included documentation indicating that antibiotics were unwarranted, and in 3 cases (0.6%) a determination was not possible.

Conclusion: In the population of suspected sepsis patients receiving antibiotics in our tertiary care ED, case review demonstrated that antibiotics were unwarranted in 12% of patients. Additional research examining the influence of bundle driven sepsis management on antibiotic utilization is warranted as we strive to balance the benefit of early treatment with drawbacks of antibiotic overuse.

208 Usefulness of the Mortality in Severe Sepsis in yhe Emergency Department Score in an Urban Tertiary Center

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Background: Sepsis continues to be a national healthcare problem and confers a significant mortality risk. The Mortality in Severe Sepsis in the Emergency Department (MISSED) score has been proposed as a simple tool to predict mortality in sepsis.

Objectives: The goal of this study is to determine if the MISSED score components are independent predictors of sepsis mortality and assess whether the MISSED score is generalizable to an urban tertiary hospital.

Methods: This is a retrospective chart review conducted from July 2012 to June 2014. Inclusion criteria consisted of adult ED patients ages eighteen and older with severe sepsis and lactate level 4 mmol/L or greater. Patients taking warfarin were excluded. Demographic information, lactate, INR, albumin and ED intubation were analyzed using chi-square, student's t-test and multivariable logistic regression. The MISSED score was calculated using the variables albumin 27 g/L or less, INR 1.3 or greater and age 65 years or older and analyzed using the ROC and AUC. The primary outcome was in-hospital mortality.

Results: A total of 223 patients met inclusion criteria. In-hospital mortality was 32%. The mean age was 57.3 years ± 16.4 and the most common source of infection was pulmonary (42%). Age 65 years or older (P=0.74) and male sex (P=0.78) were not significantly associated with mortality. The mortality group were more likely to have older age (55.8 years ± 17.0 vs 60.4 years ± 14.7; P<0.05), higher lactate (6.0 mmol/L ± 2.6 vs 7.7 mmol/L ± 4.0; P <0.0001), lower albumin (34.0 g/L ± 8.0 vs 25.0 g/L ± 7.0; P<0.0001), higher INR (1.3 ± 0.5 vs 2.5 ± 1.7; P<0.0001) and ED intubation (19% vs 56%; P<0.0001). The logistic regression model found that albumin of 27 g/L or less (OR=4.9; 95%CI 2.3-10.3), INR 1.3 or greater (OR=5.5; 95%CI 2.3-13.5) and ED intubation (OR=6.3; 95%CI 2.9-13.8) were independent predictors of mortality. The AUC for the MISSED score was 0.77 [95%CI 0.7-0.8] based on the ROC.

Conclusion: The MISSED score is a reliable mortality screening tool that may be applied to ED patients with severe sepsis. In our ED population, we found that INR 1.3 or greater, albumin 27 g/L or less and need for intubation were independent predictors of in-hospital mortality.

209 Characteristics and Outcomes of Patients Receiving Prehospital Care in Kigali, Rwanda

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Background: Prehospital care is a critical component of acute care health services, however it is frequently unavailable in low resource settings. In 2009, Rwanda developed a national pre-hospital service, Service d'Aide Medicale Urgente (SAMU). However little is known about patients receiving prehospital care.

Objectives: This study describes patient characteristics, prehospital and hospital care, and outcomes among trauma patients transferred to Kigali University Teaching Hospital (UTH-K) by SAMU in Kigali, Rwanda.

Methods: This retrospective cohort study was conducted at UTH-K, the primary trauma centre in Kigali. Injured patients transported between December 2012 and February 2015 were included. Exclusion criteria included patients transported for non-traumatic illness. Data was collected using standardized protocols by trained abstractors from prehospital and hospital records on patient demographics, characteristics of trauma, treatments received, hospital course and outcomes.

Results: Data from 909 patient encounters was accrued. The majority of patients were male 77.5% (95%CI: 73.5%-80.0%). The mean age in years was 31.7 for males and 33.2 for females (p=0.15). Road traffic accidents (RTA) accounted for 75.4% of injuries. Among patients with a documented mechanism of injury 285 (60.9%) involved motorcycles, pedestrians struck were 147 (31.4%). For patients discharged from the emergency department (ED) average length of stay was 3.2 days. A total of 355 (47.4%) patients were admitted to the hospital. For those admitted 278 (78.3%) (95%CI: 74%-83%) required surgery. Overall there were 48 (5.3%) (95%CI: 4.0%- 6.8%) mortalities with 26 deaths occurring in the ED.

Conclusion: Road traffic accidents involving motorcycles among young males constitute the majority of traumatic injury. This data agrees with previously published data on trauma patients in low-resource settings. Half of all patients transported for traumatic injuries required hospital admission, and the majority of admitted patients required surgery. Prospective data are needed to better define the epidemiology of injuries and implement interventions in the Rwandan setting.

210 Patterns of Injury at a Public Referral Hospital in Ethiopia: Opportunities for Injury Prevention and Improved Care

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Background: Injury accounts for 10% of deaths worldwide, and 90% of injury deaths occur in low- and middle-income countries. Over a third of these deaths could be averted with improved trauma care. Data

about injury patterns and clinical outcomes are essential to describe and address this large, unmet burden. Institutional trauma registries are a key tool to collecting epidemiologic data about injury in resource-poor settings.

Objectives: This study describes the demographics and patterns of injury of trauma patients presenting to a public teaching hospital with trauma expertise in Addis Ababa, Ethiopia in order to identify opportunities for injury prevention, quality improvement and further research.

Methods: This is an analysis of prospectively collected data from a sustainable institutional trauma registry data at Menelik II Specialized Hospital, a public teaching hospital with trauma expertise in Addis Ababa, Ethiopia. All patients presenting to the hospital with serious injuries requiring intervention or admission over a 7 month period were included. Univariate and bivariate analyses were performed for patient demographics and injury characteristics.

Results: A total of 576 patients with serious injuries were treated during the study period. Median age was 35 and 72% were male. The most common mechanisms of injury were traffic injuries (35%), falls (32%) and blunt assault (17%). Over half of traffic injury victims were pedestrians. Common injury settings included streets (61%), homes (16%) and workplaces (14%). Median delay in presentation was 4 hours and 9% of patients presented over 24 hours after injury. 64% of patients were transferred from another hospital or clinic. Only 3% of patients were hypotensive on arrival and 10% had moderate or severe traumatic brain injury.

Conclusion: While injury is a major public health concern worldwide, it is important to understand local patterns of injury to guide prevention and quality improvement efforts. This study highlights the utility of institutional trauma registries in collecting crucial injury surveillance data. In Addis Ababa, road safety and workplace safety are important targets for injury prevention. Our findings suggest that the most severely injured patients may not be making it to the referral centers with the capacity to treat their injuries, so efforts to improve prehospital care and triage are needed.

211 Prehospital Care in South Africa: Characterizing Complaints and Response Type by Western Cape EMS

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Background: Appropriately implemented EMS systems in sub-Saharan Africa can help ameliorate the disproportionately large burden of acute illness and injury. Elucidating the under-described prehospital burden of disease, by characterizing chief complaints (CC's) and response type, may aid development and improve outcomes.

Objectives: To characterize EMS CC's and response types in a resource-constrained South African EMS setting.

Methods: This prospective, observational study occurred within one jurisdiction (Atlantis) of the Western Cape Government's EMS system. Sex, age, response type, and chief complaints of transported patients were collected from paper EMS records and entered into a secure study database. CCs were grouped into one of seven broad categories (Table 1). Data were analyzed descriptively, and odds ratios (OR) were calculated to assess likelihood of CC resulting in a particular response type.

Results: Of 2880 total cases, 1099 (32%) were females, 1021 (35%) males and 760 (26%) unknown. EMS complaints were medical (1567, 54%), injury-related (472, 16%), obstetric/gynecologic (282, 10%), or psychiatric (182, 6%) (Table 1). Almost one-third (906, 31%) were inter-facility transports (IFTs) and 1974 (69%) primary scene transports. Ambulance trip types were statistically more likely (P<0.01) to be IFT for psych (OR=5.63, 95%CI=4.3-7.3) and obstetric/gynecological (OR=4.13, 95%CI=3.0-5.7) CC's, while primary scene transports were most likely medical (OR=2.65, 95%CI=2.3-3.1). (Figure 1).

Conclusion: Medical CCs are the leading reason for EMS utilization in this South African EMS system. Interestingly, IFTs constitute one-third of all EMS transports. Injury, obstetric/gynecology, and psychiatric CC's together comprise one-third of reasons for transport. Nearly 10% of all EMS CC data were missing or incomprehensible, calling for improved EMS data collection processes. Findings can help focus EMS training, clinical care, and operations targeted to IFTs (especially psychiatric, obstetric and gynecologic complaints) and medical complaints.

Table 1. Broad Chief Complaints For All Patients

Chief Complaint	Percentage
Medical	54%
Injury-related	16%
OBGYN	10%
Pysch	6%
Incomprehensible	5%
Inappropriately Missing	4%
Miscellaneous	5%

Table 211: Mould-Millman.

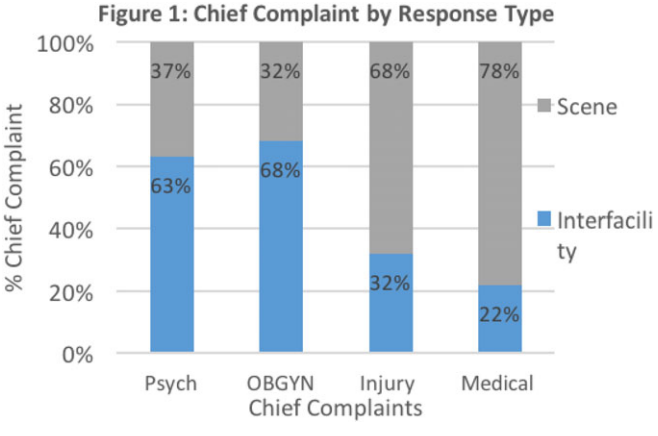

Figure 211 – Mould-Millman

212 Recruitment of 7,148 Patients for an Injury Registry in Ghana

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Background: An estimated 5 million injury-related deaths occur around the world annually, the majority of which are in low to middle income countries (LMICs). Decreasing the burden of injuries in these LMICs requires country and population specific metrics. The dearth of such detailed information however, presents a potential barrier for implementing evidence-based interventions in these vulnerable regions of the world.

Objectives: The purpose of this paper is to provide the descriptive epidemiology of the 7148 injured patients enrolled in the Kintampo Injury Registry database in Ghana.

Methods: We recruited injured patients reporting for care at 2 health facilities (rural vs urban) located in the middle belt of Ghana. Using a validated questionnaire, detailed information was collected on the demographics, causes, precipitating factors, nature, severity and clinical outcomes of all cases of injury. Patients were followed prospectively until discharge.

Results: Between January 2012 and December 2014, we recruited and enrolled 7,148 injured patients. Approximately 67% were recruited from the urban site, Sunyani and the remainder from Kintampo, the more rural site. The majority of injured patients were in the 21 to 30 age group, male and single or married. There were statistically significant differences in education between the groups, with over a quarter of the adults recruited in the rural setting having received no schooling (29.5%), compared to only 19% in the urban (p<0.001). Almost half of all the injured were involved in transportation/road traffic accidents. Only 1.5% of the injured (n=105) died. We used the Kampala Trauma Score II (KTSII) to categorize patients by injury severity. Mortality was significantly higher amongst those severely injured (KTSII≤ 6) than the mildly (KTSII 9-10) or moderately (KTSII 7-8) injured (15% vs 0.1% and 0.6% respectively, p<0.001).

Conclusion: This database is a platform for shaping health and research policy in Ghana.

213 The Clinical Presentation, Resource Utilization, and Outcomes of Patients with Sickle Cell Disease Presenting to the ED of the Muhimbili National Hospital in Dar es Salaam, Tanzania

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Background: Sickle cell disease (SCD) is prevalent in sub-Saharan Africa, but little is known about the ED presentations of patients with SCD in this setting.

Objectives: We describe the clinical presentation, resource utilization, and outcomes of SCD patients presenting to the Muhimbili National Hospital (MNH) ED.

Methods: Trained research assistants used a standardized case report form and explicitly defined variables to prospectively enroll consecutive patients presenting to the MNH ED with known or suspected SCD from 12/2014 to 07/2015. Located in Dar es Salaam, MNH is Tanzania's largest public hospital and tertiary referral center and is the site of the country's first full-capacity ED and only EM residency training program.

Results: We enrolled 752 patients from Dec 2014 to July 2015, median age 14 years (IQR: 17 years; range 1 month to 69 years), and 53% male. The most common presenting complaints were musculoskeletal pain (38%), fever (22%), and abdominal symptoms (10%). ED diagnoses included one or more infectious disease (48%), severe anemia (16%), and acute chest syndrome (10%). Nearly all patients had at least one laboratory test (99%), most commonly a complete blood count (87%), and 5% had a lumbar puncture. Twelve percent had one or more x-ray, 2% had CT imaging, and 0.4% underwent MRI. Medications administered in the ED included opiate analgesics (39%), antibiotics (24%), and anti-malarials (16%). Sixty-three percent received IV fluids and 10% had a blood transfusion in the ED. Five patients (0.7%; 95%CI 0.2%-1.5%) died in the ED and 71% (95%CI 67%-74%) were admitted to the hospital. The median length of stay for admitted patients was 3 days (IQR: 1 day) and 11 (2.1%; 95%CI 1.0%-3.7%) died in the hospital.

Conclusion: We characterize the clinical presentation, resource utilization, and outcomes of patients with SCD presenting to the MNH ED. These data will be used to inform education of clinical staff, development of treatment guidelines, and clinical research aimed at optimizing the care of this patient population.

214 Diagnostic Factors Associated with Constipation in Children Presenting to the Emergency Department with Abdominal Pain

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Background: Constipation is a common cause of outpatient-evaluated abdominal pain in children. National guideline for the evaluation and management of children with constipation recommend only history and physical findings are solely diagnostic of functional constipation.

Objectives: The purpose of this study is to delineate clinical factors that accurately distinguish constipation from other etiologies of abdominal pain in children evaluated in the emergency department (ED).

Methods: We performed a retrospective cohort study of previously healthy children aged 2-17 years presenting to the emergency department with abdominal pain during a one-year period. Children were excluded if have significant medical history or abdominal surgery. Historical and physical finding data was abstracted from the medical records of consecutive previously healthy children with no underlying medical conditions who presented with abdominal pain. To eliminate confounding, a multivariate regression analysis was performed to determine the significance of these various clinical characteristics.

Results: Of a total 2287 children evaluated for abdominal pain who met inclusion criteria and were not excluded, 584 (25.5%) had an attending-level physician discharge diagnosis of constipation. When comparing children with and without constipation who presented to the ED with abdominal pain, the factors independently significantly associated with constipation diagnosis were Caucasian race (OR 1.26, 1.06-1.58), male gender (OR 1.43, 1.16-1.79), prior history of constipation (OR 6.07, 4.23-8.72), and duration of abdominal pain > 1 day (OR 1.81, 1.46-2.24). By contrast, patients with vomiting (OR 0.46, 0.36-0.57),

diarrhea (OR 0.33, 0.23-0.46), fever in ED (OR 0.37, 0.24-0.58) or abdominal tenderness (OR 0.61, 0.49-0.75) were independently significantly less likely to have constipation.

Conclusion: History and physical findings are accurate factors in distinguishing children with abdominal pain due to constipation.

215 Direct Cost of Emergency Department Care for Agitated Patients with Schizophrenia or Bipolar Type I Disorder: A Retrospective Database Study

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Background: Despite the high frequency of emergency department (ED) visits in which patients with schizophrenia or bipolar type I disorders present with acute agitation, little has been reported on the costs of these visits.

Objectives: To better understand the direct costs of an ED visit by an acutely agitated patient with schizophrenia or bipolar type I disorder.

Methods: The design was a retrospective study of ED visits reported in the US Department of Defense electronic health record and claims dataset, covering care provided or purchased by the military for 10 million beneficiaries. Clinicians at military sites can make use of a Medcin ontology of over 200,000 medical terms to describe visit and patient medical history. Medcin data were used as there is no ICD-9-CM code for acute agitation. ED visits from Oct 2008 - Dec 2014 with Medcin data available and a principal ICD-9-CM diagnosis of schizophrenia or bipolar type I disorder were selected. Study measures included demographics, Medcin acute agitation codes, medications administered, duration and cost of visits, and inpatient admissions. Incremental effects on costs associated with agitation and treatments were estimated with linear regression analysis.

Results: The sample size was 3,979 ED visits, including 2,751 visits with duration and cost data. About 75% of the visits were with patients <35 years old. Unadjusted cost of an ED visit with an agitation code was $618 with a duration of 3.1 hours, and costs and duration increased when injectable treatments were administered (Table 1). Twenty-three percent of visits resulted in an inpatient admission. Regression analysis found the baseline mean (SE) cost of a visit with no code for agitation or treatment to be $504 ($9). Having a haloperidol injection was associated with a mean incremental cost of $248 ($96); a benzodiazepine injection, $346 ($39); both injections, $485 ($106); and having only a Medcin code, $76 ($24).

Conclusion: Cost of care of agitated patients with schizophrenia or bipolar type I disorder who require injectable treatments in the ED could be significant. Other treatment options that may be able to reduce the overall cost of managing agitation events would be valuable. Future research should assess other aspects of the burden of managing agitated patients beyond just the direct cost elements captured in claims data or medical records.

Table 1. Mean Duration and Cost by Treatment and Agitation Code

Treatment or Agitation Code	Number of visits*	Duration, hr	Cost, $
Haloperidol lactate injection	59	4.9	$917
Other injection**	169	4.5	$864
Oral medication	227	3.0	$482
Agitation code	314	3.1	$618
No agitation code or treatment	1,870	3.0	$525

*Visits can have multiple treatments or codes
**Benzodiazepines (85%) and atypical antipsychotics

216 Recipient Hospital Responsibilities: EMTALA Citations for Deficiencies Related to Psychiatric Emergencies, 2005-2014

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Background: Under the Emergency Medical Treatment and Active Labor Act (EMTALA), recipient hospitals may not refuse to accept appropriate transfer of an individual who requires specialized capabilities if the hospital has capacity to treat the individual. In 2003, the Center for Medicare and Medicaid Services (CMS) clarified that EMTALA applies to patients with emergent psychiatric conditions. In 2009, CMS adopted changes to the regulations governing EMTALA with the Inpatient Prospective Payment System (IPPS) Final Rule stating that if a patient with an unstable condition is admitted as an inpatient, EMTALA obligations end, and receiving hospitals, including psychiatric facilities, are not obligated to accept inpatients in transfer.

Objectives: To describe trends in citations for EMTALA deficiencies due to recipient hospital responsibilities related to psychiatric emergencies following the 2009 IPPS Final Rule.

Methods: A list of all EMTALA citations from 2005 to 2014 was obtained directly from CMS via Freedom of Information Act Request. Citations were coded according to the service that was alleged to be deficient (e.g. medical, psychiatric) and deficiency type (e.g. delay in exam, recipient hospital responsibilities). Citations related to psychiatric emergencies with a CMS deficiency tag 2411 indicating violation for recipient hospital responsibilities are described.

Results: Of 355 EMTALA citations related to psychiatric emergencies during the study period, 82 (23%) were related to recipient hospital responsibilities. From 2005 to 2008 there were an average of 11 citations annually, compared with an average of 6 per year from 2009 to 2014. Citations for recipient hospital responsibilities specifically accounted for 44 (29%) of 154 citations for psychiatric emergencies from 2005 to 2008, compared with 38 (19%) of 201 from 2009 to 2014 (Z-score=2.14; p=0.03). Three citations resulted in termination of CMS provider agreements and facility closure.

Conclusion: EMTALA citations related to recipient hospital responsibilities for psychiatric emergencies decreased after the 2009 IPPS Final Rule. Whether this trend represents improved care for psychiatric emergencies, improved EMTALA compliance, reduced requirements for recipient hospitals related to the 2009 IPPS Final Rule, or CMS enforcement fatigue remains to be determined.

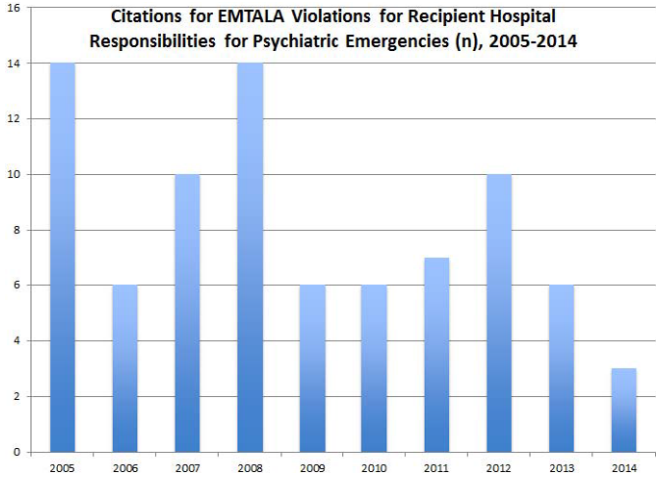

Figure 216 – Wamakima

217 A Brief Assessment and Prognosis of Cognitive and Physical Disabilities for Elderly ED Patients

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Background: As more Americans reach old age, the demand for health care increases often outpacing service availability. Persons over 75 have a high ED visit rate at 60.2 visits/100 persons, accounting for 10.2 million visits. Patients over 65 are disproportionately admitted from the ED. Admission results in deleterious outcomes unrelated to presentation such as an increase in infections, disorientation, and risk of falls. Elderly patients presenting to the ED require an assessment of their functional and cognitive status. Current disability measures used to assess functional and cognitive status are onerous, unreliable, and invalid. Discharged patients with low functional status and no outpatient follow up have more repeat ED visits. Identifying disabilities and their root causes will lead to improved care while decreasing unnecessary ED visits.

Objectives: To improve geriatric patient outcomes in EDs by modifying, validating, and testing a disability screening and prognostic tool and providing clinicians with usable point-of-care tools using health information technology.

Methods: Using random retrospective data (n=200), random prospective data (n=100) and an interdisciplinary panel of experts, we developed an instrument with several hundred disability indicators. We tested our instrument on 600 random geriatric ED patients. Data were modeled using Rasch analysis using infit and outfit statistics to develop a geriatric disability screening and prognostic test.

Results: 200 indicators were modeled using Rasch analysis to create a screening and prognostic tool with superior psychometric properties that resulted in a final list of 4 indicators and 3 follow up questions.The validation data for the assessment tool was significant at p<.0001. The prognosis was developed using ROC significant at p<.001. The time to completion was significant at p<.0001.

Conclusion: The tool takes 90 seconds verses 1 hour p< .0001 compared to the current golden standard for geriatric disability screening. The screen and prognosis are conducted at point-of-care and instantly provide a user-friendly graphic with prognostic score of death, admit, or recidivate to the ED at 30, 60, and 90 days.

Table 1 Demographic Distribution

	Demographics (N=600)	Percent
Age		
Years (mean ± std dev)		
Gender		
Male	267	45
Female	333	56
Ethnicity		
Hispanic	21	4
Not Hispanic	570	95
Unknown	9	2
Race		
White	485	81
Black or African American	96	16
Asian	2	0
Native Hawaiian	1	0
More than one Race	1	0
Unknown or Not Reported	15	3
Marital Status		
Currently Married and Living Together	272	45
Unmarried and Living Together	3	1
Never Married	1	0
Single	68	11
Separated	5	1
Divorced	64	11
Widowed	187	31
Education Level		
Less than High School	27	5
Some High School	88	15
Completed High School or GED	181	30
Some College	114	19
Completed College	190	32
Current Living Situation		
On my own	218	36
Spouse	241	40
Children	93	16
Other	48	8
Insurance		
Medicare + Medicaid	171	29

Table 217: Post.

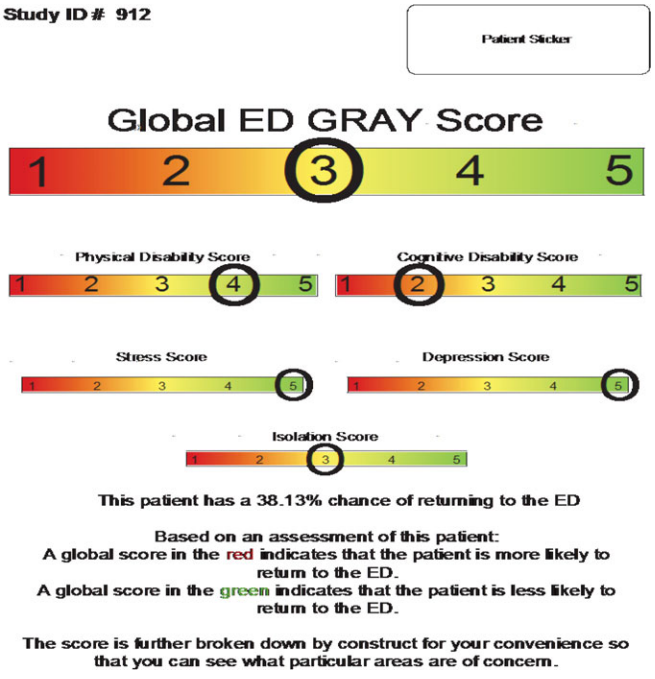

Figure 217 – Post

218 Active Treatment of Psychiatric Patients in the ED Decreases Inpatient Psychiatric Admission Rates and ED Length of Stay

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Background: There is a national psychiatric ED boarding crisis. 6-12% of all US ED visits are related to psychiatric complaints. Length of stay for these patients is at least double that of non-psychiatric patients who present to the ED. The typical ED model for psychiatric care is assessment of patients, and then boarding with minimal treatment until an inpatient psychiatric bed is available.

Objectives: The objective was to evaluate the impact of a standardized protocol of active treatment of psychiatric patients on inpatient psychiatric admission rates and ED length of stay.

Methods: This was a before and after study of all patients presenting to a high volume inner city ED with a psychiatric consultation requested. This ED is impacted by a lack of community inpatient psychiatric beds and outpatient services. This review compared inpatient psychiatric admission rates and ED length of stay before and after an intervention where a full time ED based psychiatrist was staffed and pathways for care were developed that included medication initiation and titration, case management, and discharge planning. Data was collected from electronic health records through abstraction of cases identified by a configured automated report from April 2012 to March 2015 of all patients with a psychiatric consultation in the ED.

Results: A total of 8972 patients were seen during the study period. 5738 records were evaluated from April 2012 to March 2014, which was prior to the implementation of the intervention. 3234 records were evaluated from April 2014 to March 2015, which was after the intervention. The inpatient psychiatric admission rate for the pre intervention group was 45% and post intervention group was 36% (p-value <0.05). ED length of stay, regardless of disposition, decreased from 16.54 hours to 16.17 hours (2.7% decrease) despite an increase in average monthly census from 239 patients to 269 patients (12.7% increase).

Conclusion: Active treatment in the ED with medication initiation and titration, case management, and discharge planning significantly decreases inpatient psychiatric admission rates and reduces ED length of stay.

219 An Examination of Risk Factors for the Development of Posttraumatic Stress Symptoms in Acute Coronary Syndrome Patients

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Background: For some patients, the experience an acute coronary syndrome (ACS) event is a stressful psychological experience. Among such patients, posttraumatic stress symptoms (PSS) may follow their medical event. These patients have increased ACS recurrence and mortality risk. Little is known about what factors may predispose patients to developing PSS following an ACS event.

Objectives: Our study sought to determine what pre-existing factors were associated with increased PSS symptoms in patients. Specifically, we were interested if pre-existing mental health conditions were associated with increased risk for PSS symptoms following an ACS event.

Methods: We enrolled 531 patients (age 61.2 12.6; 53% men) admitted to the ED with a provisional diagnosis of acute coronary syndrome (ACS); 33% received a final discharge diagnosis of ACS, resulting in 175 patients for our study. Patients completed a battery of surveys including their perceptions of threat (the subjective sense of danger and vulnerability), current stress, medical comorbidities and pre-existing mental health history. We assessed PSS symptoms by interview at 1 month post-discharge.

Results: We conducted a path analysis to determine the direct and indirect effects of risk factors on 1-month PSS symptoms. The model was an excellent fit to the data, χ^2 (8)=5.12, p=.75; CFI=1.0; RMSEA=0.00 (90% CI=.00-.05, PClose=.99). The variable with the largest standardized total effect (i.e., direct and indirect effects) on 1-month PSS symptoms was inpatient acute stress symptoms (.34), followed by pre-ACS PTSD symptoms (.31), and pre-ACS depressive symptoms (.28). More than half of the total effect of both pre-ACS PTSD (55%) and pre-ACS depression (54%) was attributable to indirect effects through ED threat perceptions and acute stress.

Conclusion: Pre-existing PTSD and depression was associated with increased risk for PSS symptoms. Such data can be used to potentially help identify patients at increased risk for development of PSS symptoms following a cardiac event.

220 The Effect of Clinician-Patient Communication on Posttraumatic Stress Symptoms in ACS Patients

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Background: Evaluation for a potentially life-threatening cardiac event in the emergency department (ED) is a stressful experience that can result in symptoms of posttraumatic stress disorder, which are associated with increased risk of morbidity and mortality in patients. No study has tested whether good clinician-patient communication in the ED is associated with better psychological outcomes in these individuals and whether it can mitigate other risk factors for posttraumatic stress symptoms (PSS) such as perception of life threat and vulnerability in the ED.

Objectives: The goal of this study was to investigate the relationship between clinician-patient communication and subsequent PSS in a population of patients being evaluated for possible ACS

Methods: Data were analyzed from 474 participants in the REactions to Acute Care and Hospitalization (REACH) study, an observational cohort study of ED predictors of medical and psychological outcomes after evaluation for suspected ACS. Participants reported threat perceptions in the ED and provided information on clinician-patient communication using the Interpersonal Process of Care Survey. PSS were assessed using the Acute Stress Disorder Scale during follow-up.

Results: Good clinician-patient communication in the ED was associated with lower PSS (β=-0.11, p= .005), whereas increased threat perception was associated with higher PSS ((β =0.40, p<0.001). A significant interaction between clinician-patient communication and threat perception on PSS (β = -0.13, p=.037) suggested that patients with higher threat perception benefited most from good clinician-patient communication.

Conclusion: Good clinician-patient communication in the ED during evaluation for potentially life threatening cardiac events may help offset risk for subsequent posttraumatic stress reactions. This benefit is particularly marked for patients who perceive the greatest degree of life threat and vulnerability during evaluation.

221 Pediatric Ambulance Use in the United States: The Role of Health Insurance

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Background: Rapidly rising healthcare costs require a thorough analysis of all the components of care. Ambulance utilization for low acuity cases represent significant healthcare costs. Previous studies of adult patients with public insurance or without private insurance have demonstrate that they are more likely to use an ambulance and for non-urgent conditions. Previous studies of pediatric ambulance utilization have been limited in generalizability by relying on individual hospital or single statewide databases.

Objectives: The purpose of this study was to describe pediatric ambulance utilization and its association with specific health insurances and urgency in the National Hospital Ambulatory Medical Survey (NHAMCS) database.

Methods: NHAMCS data between 2008 to 2010 for all pediatric (age <19 years) patients were analyzed. Multivariate logistic regression was used model ambulance utilization on insurance status while controlling variability in demographics and severity levels.

Results: A total of 25,215 pediatric ED visits were included representing a national sample of approximately 97,341,191 million ED visits between 2008-2010. Non-insured (9.9%) compared to privately insured (6.6%) children had significantly higher rates of ambulance utilization. No significant difference in ambulance utilization was noted between those with public (5.9%) versus private (6.6%) insurance. Even after controlling for demographic and severity variables the adjusted odds ratio (1.64, 95% CI 1.28-2.10, p<0.05) still identified insurance status as an independent predictor of ambulance utilization. In addition, older children (12-18 years), black, residing in urban areas or the Northeast also had significantly higher odds of ambulance utilization.

Conclusion: Similar to adult patients, uninsured versus insured pediatric patients have increased ambulance utilization. However, the type of insurance 9public vs. private) did not affect pediatric ambulance utilization. Health policies that facilitate continuous insurance coverage for children may be one way to maximize resource utilization in regards to ambulance use.

222 Potentially Avoidable Pediatric Transfer is a Costly Burden for Rural Families

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Background: Inter-hospital transfer is a common strategy to provide high-quality regionalized care in rural emergency departments (EDs). Children comprise a high-risk group that are commonly transferred, but many children who are transferred are discharged directly from the receiving emergency department or after a very short (≤ 1 day) hospital stay (which we previously as potentially avoidable transfer (PAT)).

Objectives: The purpose of this study is to estimate the medical and family-oriented costs associated with inter-hospital transfer, especially for those with PAT.

Methods: This study was a cohort study of all children treated in Iowa emergency departments (EDs) between 2004 and 2013 using administrative claims data from a statewide database. Records were linked across inter-hospital transfer, and outcomes were assigned from the discharging ED or inpatient record. Costs of care were estimated from (1) medical costs calculated using cost-to-charge ratios, (2) costs of ambulance transfer, and (3) family-associated costs estimated from mileage and lodging in the receiving hospital city. Analysis was stratified on 5 high-risk conditions we have previously identified. Costs were compared with the Wilcoxon rank sum test.

Results: Over 10 years, 2,086,819 children were included, of which 1% were transferred to another hospital. Inter-hospital transfer was responsible for $1,138 in additional cost for children with seizure ($p < 0.001$), $814 in additional cost for children with fractures ($p < 0.001$), $1,455 in additional cost for children with isolated traumatic brain injury without extra-axial bleeding ($p < 0.001$), $556 in additional cost for children with respiratory infections (< 0.001), and $804 in additional cost for children with asthma or wheezing ($p < 0.001$). With a weighted mean of $909 per transfer, inter-hospital transfer is one of the most costly procedures ordered by pediatric emergency physicians. A minority of these charges are attributable to non-medical patient or family costs ($21).

Conclusion: Potentially avoidable pediatric inter-hospital transfer is responsible for significant healthcare-related costs. Future work should focus on improving selection for children who benefit from inter-hospital transfer, to reduce the costly and distressing burden that PAT places on rural patients and their families.

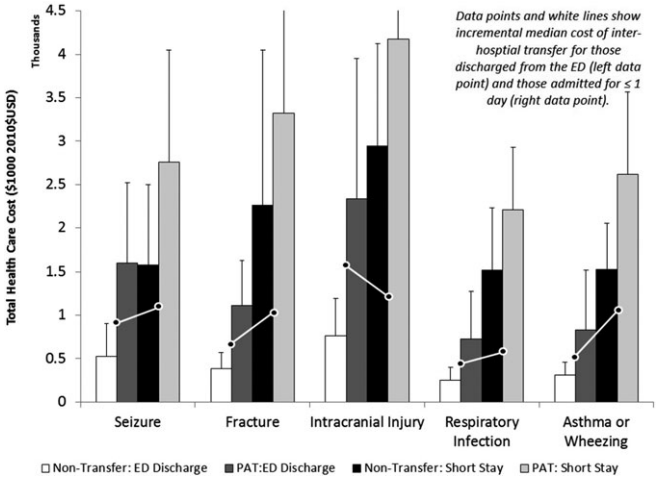

Figure 222 – Mohr

223 Emergent or Not: Characterizing Adults Transferred Away from a Free-Standing Pediatric Emergency Department

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Background: Adults may present to pediatric emergency departments (PED) with emergent conditions beyond the scope of pediatric emergency practice. They may be transferred to a facility with adult expertise. Previously reported transfer rates varied from 20-60%. However the relationship between the severity of illness and the decision to transfer is not well described and could be important for developing high quality systems for managing adults in the PED.

Objectives: We determined the proportion of adults who were transferred from a free-standing PED with emergent conditions and characterized risk factors associated with the decision to transfer adults.

Methods: We conducted a retrospective review of electronic medical records to identify all patients 25 years of age and older presenting to a large urban free-standing PED from 2008 to 2013. We collected demographic and clinical information. We used the validated New York University Emergency Department Visit Severity Algorithm (NYU EDA) to classify visits as emergent or nonemergent. A multivariate logistical regression model was used to determine independent variables associated with transfer.

Results: Of 246,694 patient visits, 1182 (0.5%) were adults older than 25 years. Of these, 496 (42%) were younger than 35 years. 253 (32%) patients had emergent diagnoses and 527 (68%) were nonemergent. The 3 most frequent emergent diagnoses were chest pain (30%), syncope (28%), and asthma (7%), and the 3 most frequent nonemergent were abdominal pain (12%), lower respiratory (8%), and back problem (7%). 611 (78%) of adults received definitive treatment in the PED. Of those who were treated, 449 (73%) were emergent and 162 (27%) were nonemergent. Only 169 (22%) adults were transferred, 91 (54%) with emergent and 78 (46%) with non-emergent. There was a statistically significant difference in rate of transfer for those with emergent compared to non-emergent (36% vs. 15%). Logistical regression identified emergent, age greater than 45 years, and higher triage acuity to be independently associated with the decision to transfer.

Conclusion: Adults requiring transfer comprised a very small proportion of patient visits to the PED. We identified independent risk factors for transfer, including; emergent condition, higher triage acuity and older age.

224 Primary Language and Return Visits in the Pediatric Emergency Department

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Background: The inability to speak or read English is a well-recognized barrier to obtaining health care in the United States. This population is also at higher risk for return emergency department (ED) visits. Discharge instructions are an important part of an ED visit in that they provide instructions on the diagnosis and follow-up care, but these are only available in English and Spanish in our department. Although English and Spanish are the two most common languages spoken in the United States, discharge instructions limited to those two languages may not adequately address the needs of certain communities such as the metro Detroit area which serves a large Arabic and Chaldean population.

Objectives: To evaluate our pediatric patient population language demographics in two metro Detroit-based hospital settings and compare the rate of 72-hour return visits for each primary language category.

Methods: Retrospective chart review of pediatric ED visits from January 1,2014 through June 30, 2015 in two academic hospital settings. Data extracted included demographics, primary language spoken, and 72-hour return visit rate. Analysis of proportion of 72-hour return visits was conducted to determine whether there was an association between primary language and 72-hour return to the hospital.

Results: A total of 56,073 charts were reviewed. Mean age was 7 years and 53% were male. Of those, 97.5% (N=54,672) identified English as their primary language followed by Arabic with 1% (N=544), Chaldean 0.4% (N= 224) and Spanish 0.3% (N=163). Rate of 72 hour return for English or Spanish was 3.87% versus 7.92% for Arabic or Chaldean speakers. The risk difference for 72-hour return to the hospital was found to be statistically significant between patients with a

primary language of Arabic or Chaldean vs. patients with a primary language of English or Spanish (estimated risk difference of -0.0405 with 95% CI: [-0.0647, -0.0163]).

Conclusion: Arabic and Chaldean languages were more common primary languages than Spanish in our metro Detroit patients. The odds of these children returning within 72-hours were twice as high as those whose primary language was English or Spanish. This illustrates the need for discharge instructions in other languages that are prevalent in the community rather than the country.

225 Pattern of Transfer of Pediatric Patients Within a Healthcare System

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Background: In the US, the majority of children present to community hospital EDs for emergency care. These visits account for about 25% of the annual ED volume. The rate of community hospital to children's hospital transfers is not well-described, nor are the reasons for transfer well-understood.

Objectives: To describe the characteristics of pediatric patient transfers within a healthcare system. We hypothesize that the majority of patients would be transferred directly to an inpatient unit at the designated children's hospital.

Methods: Study data was abstracted from two sources: an administrative database from the health system's emergency medicine service line, and a pediatric transport database maintained for quality management purposes by the children's hospital. Data was analyzed for the following time frame: January 1, 2014 to September 30, 2015. Patient demographics including age, gender, referring diagnosis, receiving unit and disposition were collected.

Results: From January 1, 2014 to September 30, 2015, there were one million visits in 12 EDs. 121,000 (12%) were pediatric visits, of which 2,379 (2%) resulted in transfer to the children's hospital. The proportion of ED pediatric patients for each hospital ranged from 5% to 20%. Four hospitals had inpatient pediatric units, three had a level 3 NICU, four had a level 2 NICU and one had a PICU. 1,325 (56%) of the transferred patients were males. The median age was 7 years. The breakdown of transfers by age was as follows: <1 year 368 (15.5%), 1-4 years 561 (23.6%), 5-9 years 482 (20.3%), 10-14 years 535 (22.5%), 15-17 years 412 (15.3%) and >17 years 21 (0.9%). There were 133 referring diagnoses. The top diagnostic categories were respiratory (16%), trauma-related (13%), surgical evaluation (11%) and neurology (9%). Of the pediatric patients transferred to the children's hospital, 34% were admitted to the floor, 10% to the PICU and 56% went to the ED. Of those patients transferred to the ED, 48% were discharged home.

Conclusion: In this system, pediatric visits comprise approximately 12% of ED visits with a transfer rate of 2%. Half of pediatric transfers result in direct admission to an inpatient unit. Respiratory illness, trauma and surgical evaluation comprise the top three reasons for transfer.

226 Otitis Media Visits to the Emergency Department in Ages 0 to 21 Years have Decreased from 1999 to 2015

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Background: Otitis media (OM) is a common reason for ED visits in the pediatric population. The leading bacterial cause of OM is pneumococcus. Introduction of the pneumococcal vaccine in 2000 and subsequent other vaccines in the United States have reduced pneumococcal infections.

Objectives: We postulate that ED visits for OM in ages 0-21 years have decreased following the introduction of pneumococcal vaccines starting in 2000.

Methods: Design: Retrospective cohort of consecutive ED visits. Setting: Seven New Jersey suburban and urban EDs with annual visits from 27,000 to 84,000. Population: Consecutive patients seen by ED physicians between 1/1/1999 to 8/31/2015. Protocol: We identified patients between the ages of 0-21 years using ICD9 codes for otitis media. Data Analysis: We calculated the annual percentage of patients (ages 0-21 years old) diagnosed with OM. We then calculated the difference in annual percentages and the 95% confidence interval between the years 1999 and 2015. We also calculated the linear regression coefficient R squared for annual percentages versus year.

Results: Of the 6,056,541 patients in the database there were 1,673,393 (27%) visits for patients ages 0 to 21. In this age group, 89,263 (5.3%) patients had OM. The median age was 2.2 years; with an interquartile range of 1.2 to 4.6 years and 45% were female. The percentage of OM decreased from 1999 to 2015 from 6.4% to 3.8%, a statistically significant 41% relative decrease (95% CI, 38%-44%). The correlation coefficient R squared of the linear regression line is 0.85 ($p < 0.001$) (See Patel Figure 1).

Conclusion: The annual percentage of ED visits for OM in ages 0 to21 years decreased by 41% from 1999 to 2015. We speculate that this is due to the introduction of pneumococcal vaccines starting in 2000. However, other factors such as changes in pediatric office practice, increased use of tympanostomy tubes, adoption of the "wait and watch approach" and more recently, the redefinition of the diagnostic criteria for OM may have contributed to this decline.

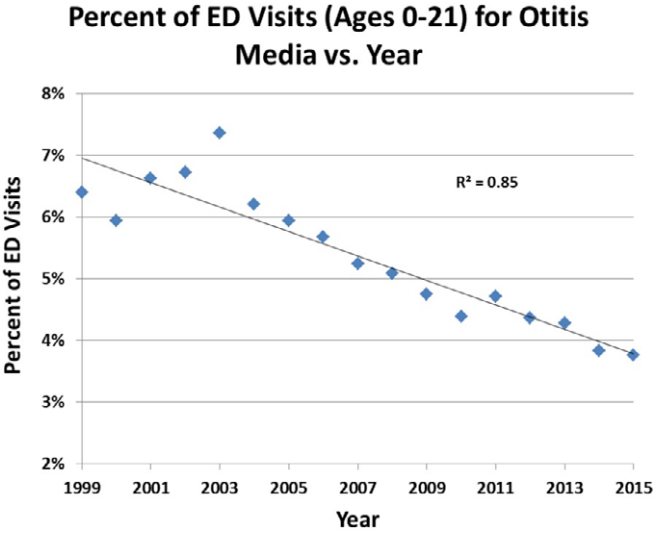

Figure 226 – Barata

227 High-Impact Hepatitis C Virus Testing for Injection Drug Users (HIT IDU) in an Urban Emergency Department

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Background: Emergency departments (EDs) represent an emerging venue for hepatitis C virus (HCV) screening, particularly for persons who use injection drugs (PWIDs). We therefore implemented the "High Impact HCV Testing for Injection Drug Users", or the "HIT IDU" initiative, an emergency physician (EP) based screening program.

Objectives: The objective of this study was to evaluate the outcomes of this clinical protocol.

Methods: A prospective observational study was conducted in an urban, public ED with an annual census of 80,000 visits. The HIT IDU initiative encouraged EPs to integrate targeted HCV screening into care, with an emphasis on screening all PWIDs, although screening was not limited to this subgroup. Physicians selected the primary indication for HCV screening from a drop-down menu built into the electronic ordering process that included: injection drug use, liver disease of uncertain etiology, patient requested test, confirm patient report, or other. The primary outcome was the absolute number and overall prevalence of EP-based HCV antibody positive tests, further stratified by the indication for screening.

Results: Over the three-month study period, 14,253 unique patients were evaluated and EPs tested 155 patients for HCV (1.1%, 95% confidence interval [CI] 0.9% to 1.2%), with PWID accounting for 73 (47%) of them. Forty (26%, 95% CI 19% to 33%) were antibody positive. The prevalence of HCV antibody positivity by testing indication was: PWID 48% (34/73, 95% CI 35% to 59%), patient requested HCV test 10% (4/40, 95% CI 3% to 24%), confirm patient report 67% (2/3, 95% CI 9% to 99%), liver disease of uncertain etiology 0% (0/3, 95% CI 0% to 71%), and other 0% (0/36, 95% CI 0% to 10%). Thirty of the 40 HCV antibody positive patients (75%) completed confirmatory ribonucleic acid testing, of which 22 (73%) had detectable viral loads. Of the 22 chronically infected patients, 19 had follow-up care arranged within 3 months.

Conclusion: When EPs use targeted HCV screening, high rates of infection are identified, particularly among PWID. The overall amount of screening, however, was low and broader screening initiatives are needed to identify a higher proportion of ED patients with undiagnosed HCV.

228 Urban Emergency Department Patients Lack General Knowledge of Hepatitis C Virus Infection

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Background: With the advent of rapid testing technology and novel curative treatments there is growing support for hepatitis C virus (HCV) screening in emergency departments (ED). Little is known, however, about patients' knowledge of HCV, which may influence screening uptake and adherence with follow-up and treatment.

Objectives: The objective of this study was to evaluate ED patients' knowledge about HCV risk factors, modes of transmission, and treatment.

Methods: A 3-month, cross-sectional survey study was carried out in an urban ED with an annual census of 80,000 visits. A trained research assistant administered the survey that included 10 True/False questions adapted from the validated Brief HCV Knowledge Scale to consecutive, eligible adult patients during pre-specified blocks of time.

Results: During the study period, 589 patients were screened for eligibility, 270 were eligible, and 200 completed the survey. Participants' median age was 44.4 years (SD 15.0), 47% were female, 54% Black, 19% Hispanic, and 16% White. Forty-five % were born within the high-risk birth cohort (n=89) and 7.5% reported injection drug use (IDU) (n=15). The average % of accurate responses was 64% (95% confidence interval [CI] 61% to 67%). Patients in the birth cohort scored significantly lower than those outside the cohort (61% vs. 66% correct, $P < 0.044$) and patients with IDU scored significantly higher than those without (75% vs. 63% correct, $P < 0.031$). Overall, most patients were aware that HCV infection can be asymptomatic (81%, 95% CI 76% to 86%), using clean needles prevents HCV transmission (80%, 95% CI 74% to 86%), and sharing razors/toothbrushes can transmit HCV (81%, 95% CI 75% to 86%). However, the majority of patients (66%, 95% CI 59% to 72%) answered that HCV was not curable and nearly half (47%, 95% CI 40% to 54%) incorrectly answered that HCV is vaccine-preventable.

Conclusion: Many ED patients understand the link between IDU and needle sharing and HCV transmission and recognize the existence of asymptomatic infection, but most are unaware of curative treatment for HCV and many incorrectly believe that HCV is vaccine-preventable. Patients born in the birth cohort, a group for which the CDC recommends targeted screening, are less knowledgeable about HCV than others. Educational initiatives should be integrated into screening programs to close the knowledge gap.

229 Cascade of Care for Emergency Department Patients Identified with Hepatitis C Virus Infection: An Evaluation of Longitudinal Outcomes

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Background: The hepatitis C virus (HCV) Cascade of Care (CoC) is a population health model used to evaluate screening programs and identify gaps in care. National estimates using this model for chronically-infected outpatients suggest that 40% are linked to care and 15% receive treatment. Despite identifying high numbers of patients with undiagnosed infection, little is known about the longitudinal outcomes of emergency department (ED) HCV screening programs.

Objectives: The objective of this study was to propose an ED-specific HCV CoC and apply it to our ED screening program.

Methods: This is a retrospective cohort study of patients screened for HCV in an urban ED. A nurse-initiated program targeting patients within the birth cohort and those who use injection drugs (IDU) was in place with administrative support. We adapted the CoC to the ED setting in consultation with content experts. The ED HCV CoC included the following steps: 1) HCV antibody positive; 2) HCV viral load performed; 3) HCV viral load positive (chronically infected); 4) follow-up arranged; 5) attended follow-up appointment; and 6) treatment initiated. The study period was 18 months: a 6-month screening phase followed by a 12-month follow-up period. We report the number of patients completing each step of the cascade.

Results: There were 2,450 unique patients screened for HCV with an antibody prevalence of 9.7%. The CoC is as follows: of the 238 antibody positive patients, 80% (95% confidence interval (CI) 75%-85%) completed viral load testing; of which 71% (95% CI 64%-77%) were confirmed positive; of whom 71% (95% CI 63%-79%) had a follow-up appointment scheduled; of whom 67% (95% CI 56%-76%) attended their appointment; and of whom 23% (95% CI 14%-36%) initiated HCV treatment. Of the 135 chronically-infected patients, 64 (47%, 95% CI 39%-56%) attended follow-up, 15 (11%, 95% CI 6%-18%) were treated, and 15 (11%, 95% CI 6%-18%) died.

Conclusion: The ED HCV CoC is a useful model to evaluate longitudinal outcomes of screening programs, and can help identify gaps in the multiple steps required for disease confirmation and definitive care. While the CoC demonstrates significant challenges at each step, the quality of this ED-based program is comparable to national outpatient-based programs.

230 HIV Disclosure Context: A Target for Enhancing Linkage to Care

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Background: As routine HIV screening in acute care settings expands, meeting national linkage to care (LTC) goals - 85% LTC within

90 days of new HIV diagnosis - remains a significant challenge. While patient-related factors such as race, unstable housing, substance abuse, and insurance status have been associated with failure to link to care, few studies focus on the impact of the initial disclosure process on LTC.

Objectives: To examine differences in LTC based on disclosure context, specifically who discloses test results (trained HIV medical social worker (MSW) vs. ED provider) and when results are disclosed (during ED visit vs. after discharge).

Methods: In July 2013, we implemented routine opt-out HIV screening in the ED of an urban safety-net hospital. Disclosure context, LTC and demographic data were analyzed for ED patients with a new HIV diagnosis who were linked to care, even after 90 days. LTC was defined as 1st appointment with a prescribing provider assessed by EMR review and patient self-report.

Results: From July 2013 through September 2015, we tested 41,247 patients and identified 391 confirmed new positive patients (0.95%). Of the 347 who received positive result disclosure, 152 (43.2%) were disclosed to by the HIV MSW. LTC was higher among patients disclosed to by the HIV MSW (64.5% vs. 49.7% ED provider, $p<0.01$). The majority of patients (290, 83.4%) were disclosed to during their ED visit. There was no difference in LTC frequency based on the timing of disclosure (55.6% ED visit vs. 56.1% after discharge, $p=0.96$). On average, LTC took 35.2 days longer in the delayed disclosure group (101.8 vs. 66.6 days ED visit, $p=0.06$), which is not fully explained by the mean days between HIV result and delayed disclosure (29.5 days, median: 6 days). When limiting LTC data to only patients linked within 90 days, LTC remained higher for patients disclosed to by the HIV MSW (52.6% vs. 37.4% ED provider, $p<0.01$). There were no significant differences in mean age, sex, race, or insurance status between any of these groups.

Conclusion: Achieving national LTC goals in our ED setting is challenging. While many patient-related barriers to linkage exist in our population, this analysis suggests that disclosure context has a significant impact on LTC. Models that promote disclosure by trained HIV MSWs on the day of diagnosis may improve frequency and timing of LTC.

231 Accuracy of Diagnosis of Urinary Tract Infection in the Emergency Department

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Background: Urinary tract infection (UTI) is frequently diagnosed in the emergency department (ED). Because the gold standard for diagnosis of UTI, urine culture, is not immediately available, the diagnosis is made on the basis of clinical findings and laboratory testing including urine dipstick and urine microanalysis. Small studies have shown a high rate of misdiagnosis. Misdiagnosis of UTI leads to prescribing unnecessary antibiotics and may also cause clinicians to fail to identify the true cause of a patient's symptoms.

Objectives: To quantify the accuracy of diagnosis of urinary tract infection (UTI) in the ED.

Methods: The electronic health record (EPIC) was queried to retrospectively identify all patients diagnosed with UTI in the ED over a six-month period at two academic medical centers. Patients of all ages were included in the analysis. Discharged and admitted patients were included. Patients were excluded if the result of a urine culture was not available. The standard ED urinalysis order at these centers includes an automatic reflex to culture if greater than 5 white blood cells are present on microscopy. Urine cultures were considered positive, and the diagnosis of UTI accurate, if growth of a single urinary pathogen was reported at greater than a threshold number of colony forming units (cfu) per milliliter (mL). Accuracy of UTI diagnosis was calculated using two different threshold numbers; the generally recognized standard of 10^5 cfu/mL and a lower threshold of 10^4 cfu/mL.

Results: 2157 patients with a diagnosis of UTI and urine culture result were identified. Using a standard of 10^5 cfu/ml of a urinary pathogen as a positive culture, 858 (39.7%) were positive. Using a lower threshold of 10^4 cfu/mL resulted in 1129 (52.3%) positive cultures.

Conclusion: Patients are frequently misdiagnosed with UTI in the emergency department. This likely leads to significant inappropriate antibiotic treatment. Further study is needed to identify reasons for this high rate of misdiagnosis as well as data elements that could improve diagnostic accuracy.

232 Geriatric Observation Unit Protocols

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Background: Older adults are often considered inappropriate for Emergency Department observation unit care due to their high risk of admission for psychosocial and home safety issues.

Objectives: We wished to develop ED observation protocols that address the added needs of older adults in the ED and best ensure safe discharge to home.

Methods: A multidisciplinary, geriatric-specialized team identified common needs of older adults in the ED and developed pathways using existing health system resources to address these needs. The two geriatric syndromes chosen were Frailty and Fragility Fractures. The protocols were launched in November 2015.

Results: Community dwelling older adults' medical needs may include in depth assessment of vulnerability, psychosocial needs, medication interactions, and fall risk. The Frailty protocol mobilizes inpatient resources to the ED observation unit to address these issues. The protocol offers consultation by a geriatrician, pharmacist, physical therapist (PT), social worker, or case manager, depending on individual needs. Outpatient follow-up in specialty clinics will be arranged based on consultant recommendations (Figure 1). The Fragility Fracture protocol is for ambulatory older adults with new fractures. The protocol includes appropriate training with assistive devices, pain control, and arrangement for early physical therapy. Further prevention of secondary fractures and falls will be accomplished by referrals to a High Risk Osteoporosis Clinic (a dual orthopedics and endocrinology clinic) and a Falls Clinic run by physiatrists.

Conclusion: Older adults often require more resources than the ED can provide in a short stay. Geriatric observation protocols may be able to improve care by identifying patient needs and home safety issues. Potential health system benefits include prevention of unnecessary admissions, reduction in inpatient denials, and prevention of ED recidivism. Further studies will address the impact of geriatric protocols on these quality metrics.

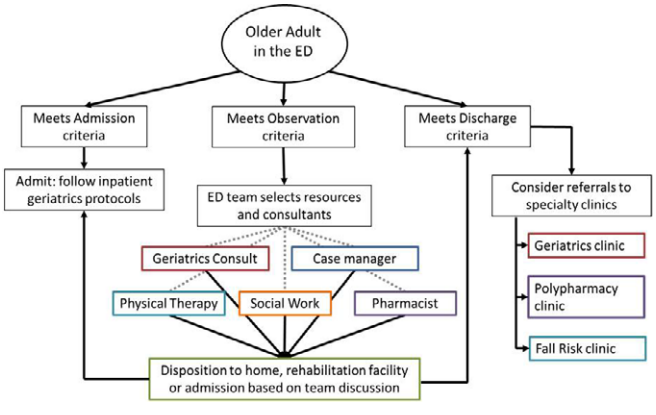

Figure 232 – Southerland

233 Propylene Glycol Reduces Acetaminophen Toxic Metabolite Production in Humans Suggesting a Role for Decreasing Toxicity

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Background: Acetaminophen (APAP) induced liver injury is caused by reductive metabolism of APAP to the radical metabolite, n-para-amino benzoquinone imine (NAPQI), principally via cytochrome P-450 (CYP) 2E1. NAPQI subsequently forms minor metabolites. We previously showed that ingestion of a liquid formulation of APAP with excipients including propylene glycol (PG), which inhibit CYP2E1, reduced production of minor metabolites relative to a solid formulation. These findings imply that PG inhibits reductive metabolism and that this may be hepatoprotective, as it is in animals and tissue culture. APAP dosed at four grams per day results in a mild elevation in alanine aminotransferase (ALT) in approximately 30% of people after approximately ten days, providing a potential model to prospectively study liver injury in humans.

Objectives: Our aims were to investigate the effect of PG specifically on reductive metabolism and ALT in subjects during two weeks of APAP dosing.

Methods: We performed a crossover study. Healthy subjects were administered four grams of APAP daily in divided doses for fourteen days, underwent a washout period, then repeated the protocol. Subjects were randomized to be co-administered 5 milliliters of 99% PG with each dose of APAP in either the first or second treatment period. APAP metabolites and ALT levels were measured daily. Subjects whose ALT levels rose to twice baseline were deemed responders.

Results: The percent of minor metabolites was significantly decreased in the APAP with PG arm for all subjects relative to the APAP only arm (5.5% vs. 3.8%, P=0.007). The percent of minor metabolites was decreased to a greater degree among responders (7.6% vs. 4.1% P=0.031). There was no significant difference in minor metabolite percentages in the non-responders (4.6% vs. 3.6%, P=0.162). There were six responders in the APAP only arm and eight in the APAP/PG arm. Five subjects were responders in both arms. Peak ALT occurred sooner and was higher in responders administered APAP only relative to responders taking APAP and PG (3 x baseline, day 9 vs. 2.5 x baseline, day 12).

Conclusion: PG inhibits bioactivation of APAP, likely via inhibition of CYP2E1. Effect is increased in the responders, who appear susceptible to APAP toxicity. There is a trend to decreased ALT in the PG treated responders, suggesting a protective effect of PG on APAP induced liver injury in humans.

234 Salicylate Poisoning: Risk Factors for Severe Outcome

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Background: ASA poisoning remains a significant public health threat with upwards of 20,000 exposures annually in the US and morbidity/mortality rates of up to 25%.

Objectives: In order to facilitate targeted treatment to lower these rates, we aimed to establish early predictors of severe in-hospital outcomes in ED patients presenting with ASA poisoning.

Methods: This was a secondary data analysis of ASA overdoses from a prospective cohort study of suspected acute drug overdoses at two urban university teaching hospitals from 2009-2013. Patients were enrolled consecutively and were considered eligible for inclusion based on clinical suspicion of ASA ingestion. Children (<18) and alternate diagnoses were excluded. Demographics, clinical parameters, serum ASA concentrations, treatment modalities and death/admission rate were collected from the medical record. Severe outcome was defined as a composite occurrence of any of the following: acidemia (pH<7.3 or bicarbonate<16mEq/L), hemodialysis, or death.

Results: 48 patients met inclusion criteria, with 43.8% male, median age 32, mean initial ASA concentration 28.1, and 10 (21%) classified as severe outcome. There were two deaths, neither of whom received hemodialysis. Patients were treated with sodium bicarbonate in one-third of cases, while 54.2% received activated charcoal and 64.6% were admitted. Univariate analysis indicated that age, respiratory rate (RR), creatinine, lactate, coma, and presence of co-ingestions were significantly associated with severe outcome, while ASA alone had no association. However, when adjusted for serum ASA concentration, only age (OR 1.02 per additional year, 95%CI 1.0-1.1), RR (1.09 per additional breath/min, 95%CI 1.03-1.15), creatinine (2.8 per additional mg/dL 95%CI 1.1-7.1), and co-ingestions (OR 6.4, 95%CI 2.3-17.8) were independent predictors of severe outcome.

Conclusion: Age, RR, creatinine, and co-ingestions are predictive of severe outcome in ED patients with acute ASA poisoning, while serum ASA concentration alone is not. Despite the severity of these cases, only one-third received sodium bicarbonate, suggesting potential barriers to administration which require further study.

235 Racial Disparities in the Treatment of Acute Overdose in the Emergency Department

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Background: Racial disparities continue to exist in many disciplines of medicine extending to care in the Emergency Department (ED). A disparity can be defined as a difference in the quality of health care due to environment, access to care, health status, or particular health outcomes.

Objectives: We hypothesized that Blacks would be less likely to receive treatment with activated charcoal or antidotes when presenting to the ED for acute drug overdose.

Methods: We completed a secondary analysis of a prospective cohort of 3242 cases of patients presenting to 2 urban tertiary care hospitals with suspected acute overdose between 2009-14. Categorical variables were analyzed with a chi square test with 2-sided p values and 5% alpha. OR were calculated with 95% CI. Assuming a baseline rate of 25% and alpha=0.05, we had >80% power to detect an 18% difference in the rate of antidote administration.

Results: We screened 3242 patients, of those, 2664 were included and 410 were excluded (alternate diagnosis (93), a lack of data (188), pediatric age (53), and other (76)). Mean age was 41.5 years, 55% were men; Black 21.8% (580), Whites 33.67% (897), Asians 6.9% (183), other 6.9% (185), and Hispanics 30.4% (811). Overall 219 cases were treated with activated charcoal, either single or multi dose, and 523 people were treated with an antidote (naloxone (257), N-Acetylcysteine IV or PO (136), calcium (101), sodium bicarbonate (91), glucagon (39), octreotide (29), digoxin immune fab (10), high dose insulin therapy (6), physostigmine (6), fomepizole (5), dantrolene (2), flumazenil (2), or intralipids (1)). Results indicated that blacks were less likely to receive activated charcoal, either single or multi dose, [Black 16.4%, non-Black 83.56%, p 0.04, OR 0.687, CI 0.48-0.99] and were much less likely to receive any antidote at presentation [Black 14.1%, non-Black 85.9%, p< 0.01, OR 0.533, CI 0.41-0.69].

Conclusion: Blacks are significantly less likely to receive either activated charcoal or any antidotes when presenting to the ED for acute drug overdose. Further studies are needed to determine national prevalence and how race plays a role in management of acute overdose.

236 Cutting to the Chase: Observations on Debridement in Crotalid Envenomation

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Background: Skin necrosis and fluid-filled or hemorrhagic bullae may occur following crotalid envenomation. Debridement has been

described as treatment but there is limited published literature to support or refute this practice. Debridement may restore mobility where limited by bullae but may also expose unprotected tissue to pathogenic contamination and increase pain.

Objectives: We sought to compare clinical characteristics and outcomes in patients who underwent debridement versus those where debridement was not performed in crotalid associated necrosis or bullae.

Methods: A retrospective case-series was constructed from the ACMT ToxIC North American Snakebite Registry for cases between Jan2013 and Nov2015. Patients in which skin necrosis and/or bullae were present were included for analysis. Cases of incision and drainage for infections were excluded from analysis. Age, gender, bite location, offending crotalid (rattlesnake, cottonmouth, or copperhead), antivenom administration, Snakebite Severity Score (SSS), administration of antibiotics, and length of hospitalization (LOS) were recorded. The SSS was calculated using an online score calculator. Comparisons between subjects with and without debridement were performed.

Results: Four-hundred-twenty cases of crotalid-exposures were identified during the time-interval. Sixty-nine victims developed skin necrosis and/or bullae. Nineteen patients (28%) underwent debridement. Debridement took place most commonly for male patients and in upper extremity bites. There were no differences identified in age, SSS, number of vials of antivenom administered, or responsible crotalid. Performance of debridement was associated with statistically significant higher rate of antibiotic administration for confirmed cellulitis and longer hospital LOS. (see TICSS Table)

Conclusion: Patients who undergo debridement in the treatment of crotalid-associated skin necrosis or bullae may be at increased risk for cellulitis and increased hospital LOS. The present case series however is limited by a small number of observations (especially amongst debridement group) and wide confidence intervals. Future prospective studies are warranted to identify benefits or complications associated with debridement in the treatment of crotalid-associated bullae or skin necrosis.

Table: Demographics and comparison between debridement and no debridement completion

	Debridement (N=19)	No Debridement (N=50)
Female [CI]	0 (0%) [0, 18]	17 (34%) [21, 49] *
Bite Location		
Upper [CI]	18 (95%) [74,100]	34 (68%) [53, 80]*
Lower [CI]	1 (5%) [0.1, 26]	16 (32%) [20, 47]*
Crotalid		
Copper [CI]	2 (11%) [1,33]	14 (28%) [16, 42]
Cotton [CI]	0 (0%) [0.05,18]	1 (2%) [0.05, 11]
Rattle [CI]	17 (89%) [67, 99]	35 (70%) [55, 82]
Antibiotic [CI]	6 (32%) [13, 57]	5 (10%) [3, 22] *
Reason for Antibiotic		
Confirmed [CI]	5 (26%) [9, 51]	2 (4%) [5, 14] *
Prophylaxis [CI]	1 (5%) [0.1, 26]	3 (6%) [1, 17]
Age (y)		
median (IQR)	35 (35)	20 (45)
SSS		
median (IQR)	2.5 (2)	3 (2)
Vials Antivenom		
median (IQR)	13 (5)	12 (9)
Hospital LOS (d)		
median (IQR)	3 (2)	2 (1) ^

[CI]: 95% Confidence Interval
Copper: Copperhead
Cotton: Cottonmouth
Rattle: Rattlesnake
Confirmed: denotes confirmed cellulitis
Prophylaxis: antibiotics to prevent cellulitis
SSS: Snakebite Severity Score
LOS: Length of Stay

* Z Test for proportion (two-tail) p value <0.05
^Mann Whitney U test (two-tail) p value <0.05

Table 236: Darracq.

237 Rattlesnake Envenomation in Pediatric and Adult Patients

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Background: Venomous snakebites affect up to 10,000 Americans annually, with nearly 25% occurring in pediatric patients. Despite the relatively common occurrence, objective data comparing adult to pediatric patients are lacking. The Toxicology Investigators Consortium (ToxIC) North American Snakebite Registry was established to collect accurate data on snakebite victims treated by toxicologists.

Objectives: The primary purpose of this study is to use the North American Snakebite Registry to compare the presentation and treatment of adults versus pediatric patients following a rattlesnake envenomation.

Methods: This study is a prospective cohort study of individuals with rattlesnake envenomation, who were entered into the registry between 3/2013 through 9/2015. The following definitions were established *apiori*: pediatric (< 18 years); coagulopathy (prothrombin time ≥ 16 seconds or fibrinogen < 150 mg/dL), thrombocytopenia (platelet < 150,000/uL). Independent associations were assessed via Chi squared test and Fisher Exact test (as appropriate) for categorical variables. Medians with interquartile ranges were assessed for ordinal data.

Results: A total of 420 subjects were entered into the registry including 240 rattlesnake bites. Among the rattlesnakes bites, the median age was 28 (11-51) years; 70% are men. Upper extremity bites were more common in adults (104/181; 57%) compared with pediatrics (15/59; 25%. p<0.001). There was no difference between the groups with regards to the development of edema, length of stay, or surgical procedures. The median (IQR) number of vials of antivenom administered was similar between groups; 10 (6-16) in pediatrics vs. 10 (6-14) in adults. While hematologic toxicity was similar in pediatric vs. adult patients (22/59; 37% vs. 80/181; 44%; p=NS), thrombocytopenia was less commonly encountered in pediatric patients compared with adult patients (8/59; 13% vs. 52/181; 29%; p=0.023). There was no difference observed in the rate of coagulopathy (22/59; 37% pediatric; 53/181; 29% adult).

Conclusion: Overall, pediatric and adult patients exhibit similar morbidities. However, in this study, both the development of thrombocytopenia as well as the location of bites differs between pediatric and adult patients. Most other parameters are unchanged between adults and pediatric patients.

238 20,000 Person-Years Later: Long-Term Mortality in a Large, Population-Based, Regional Drowning Registry

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Background: Relatively little is known about long-term outcomes of drowning. Small cohorts reveal some evidence of long-term neurocognitive dysfunction, but large epidemiological studies are lacking.

Objectives: To assess long-term mortality of drowning victims from a large registry. We hypothesized that patients with sequelae of more severe injury are at higher risk of long-term mortality.

Methods: Secondary analysis of a population-based, regional drowning registry from western Washington. We included patients that survived to hospital discharge, tabulating Utstein-style variables with descriptive statistics. We used the National Death Index to assess long-term mortality beyond the index event through 2012. Wilcoxon rank-

sum and chi-square tests assessed differences between long term survivors and non-survivors. We constructed KM curves, stratified by age, sex, drowning-related cardiac arrest, and pCPC at hospital discharge, and compared them with the log-rank test. Cox proportional hazard modeling tested variables associated with long-term mortality.

Results: Of 2,824 subjects in the registry (submersion 1/74 - 7/96), 776 (27%) survived to hospital discharge and were included in our analyses (median age 5 years, IQR 2-15; 68% male). Long term survivors and non-survivors differed by age (4 years, IQR 2-15 vs. 25 years, IQR 6-46; p<0.0001), recreational substance use (4% vs. 18%; p<0.001), pre-existing comorbidities (16% vs. 38%; p=0.01), drowning-related cardiac arrest (7% vs. 25%; p<0.0001), mechanical ventilation (13% vs. 37%; p<0.0001), and seizures (2% vs. 10%; p<0.0001). Only 63 (8%) subjects died during the 19,699 person-year follow-up period. Subjects with age >40 years (p<0.0001), drowning-related cardiac arrest (p<0.0001), and pCPC 4-5 (p<0.0001) were at higher risk of long-term mortality. In adjusted analyses, age (HR 1.05; 95% CI 1.03, 1.07) and mRS 4-5 at hospital discharge (HR 8.2; 95% CI 1.8, 36.4) were associated with long-term mortality.

Conclusion: Overall mortality was low during long term follow-up. Age at the index event, drowning-related cardiac arrest, and functional status at hospital discharge were associated with subsequent long term mortality.

239 Use of the PERC4 Model to Develop Targeted Suicide Screening Rulers in the Emergency Department

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Background: Many patients treated in the emergency department (ED) have elevated suicide risk but are not screened if they do not present with a psychiatric chief complaint. Universal screening can potentially address this problem but gold standard tools, such as the Beck Scale for Suicidal Ideation (BSS), are too cumbersome to use in the ED.

Objectives: To compare the agreement between several novel, user-friendly, highly efficient 0 to 10 points suicide risk rulers to the gold standard BSS.

Methods: This study enrolled 399 ED patients; 361 (90%) presented with non-psychiatric chief complaints and 28 (10%) had psychiatric chief complaints. Participants completed eight suicide risk rulers and the BSS. The ROC curves for each ruler was computed against an overall positive BSS screen and the BSS total score >2, a clinical cutoff predictive of future suicidal behavior.

Results: The ruler determinations (area under the ROC curve) and sensitivity/specificity, as well as Person correlation coefficients with BSS total scores are summarized in Table 1.

Table 1: Ruler Determinations and Optimized Scores for Positive Suicide Screens

Rulers: (1-10 Scales)	Index				
	Positive Screen, BSS Criteria (Question Item 4 or 5 >0) [27 Positive, 336 Negative]		Positive Screen, Total BSS Criteria (Total Score >2) [33 Positive, 347 Negative]		BSS Total Sum Score
	Determination	*Optimized Score* (Sensitivity, Specificity)	*Determination*	*Optimized Score* (Sensitivity, Specificity)	*Pearson Correlation* Sig (2 Tailed = 0.00)
Overall life quality	0.129	1 (0.630, 0.033)	0.1	1 (0.606, 0.029)	-0.416
Pain	0.564	1 (0.815, 0.223)	0.562	1 (0.848, 0.222)	0.117
Thoughts of killing oneself	0.839	1 (0.704, 0.979)	0.867	1 (0.758, 0.983)	0.811
Thoughts of Suicide	0.859	1 (0.741, 0.967)	0.870	1 (0.667, 0.983)	0.866
Sadness	0.876	3 (0.926, 0.676)	0.910	4 (0.879, 0.746)	0.454
Wishing to go to sleep and not wake up	0.891	1 (0.852, 0.875)	0.914	2 (0.879, 0.908)	0.668
Hopelessness	0.902	2 (0.963, 0.744)	0.911	3 (0.909, 0.79)	0.668
Wishing to be dead	0.958	0 (0.963, 0.905)	0.982	1 (0.909, 0.948)	0.779

Conclusion: Patient responses to questions utilizing numerical scales describing their levels of hopelessness, wishing to go to sleep and not wake up, and wishing they were dead are sensitive and specific predictors of a positive score on the gold standard BSS and warrant further prospective study.

240 Predictors of Hospital Admission for Patients Presenting to the Emergency Department with Suicidal Ideation

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Background: Suicidal Ideation (SI) is a common condition evaluated in the emergency department (ED). Given the frequency and potential morbidity of SI, an understanding of what patient variables of ED care are associated with admission would be useful for clinicians and researchers.

Objectives: To examine the association between patient variables of patients with SI in the ED and subsequent hospital admission.

Methods: We analyzed 2009 and 2010 ED visits from the National Hospital Ambulatory Medical Care Survey (NHAMCS). The population was defined as patients presenting with suicidal ideation, identified by ED primary diagnoses corresponding to ICD-9 codes. Primary outcome was admission to hospital. Descriptive statistics were used to summarize rate of admission and patient characteristics. Multivariable logistic regression was performed to identify variables associated with hospital admission. Covariates included, gender, age, race, arrival by ambulance, insurance status, multiple visits to ED in 72 hours, recent discharge from hospital, and presence of mental health care provider

Results: 308,063 patients with age range of 7 to 84 years were identified. The SI cohort was 80% White,9.1% Black and 8.9% Hispanic. 15.7% was privately insured, Medicare 21.2%, Medicaid 32%, with 31% uninsured/self pay. 8.9% were seen in the ED in past 72 hours and 22% had 6 or more visits in the past year. 81.5% of the SI patients were admitted or transferred to a psychiatry service. There was no statistically significant correlation with age, gender, arrival by ambulance, triage level, intentional injury/poisoning or being seen by a Mental health provider and likelihood of admission. Multivariate modeling showed increased likelihood for admission for those with Medicare (OR 393.1, 95% CI 16.6-9289.6) and decreased likelihood of admission with frequent past visits (OR=.853, 95% CI .760 -.958), blacks (OR=.113, 95%CI .0139-.914) and hispanics (OR=.013, 95% CI .001-.138) .

Conclusion: Our study found various characteristics associated with hospital admission for patients with SI. This data may guide future work aimed at improving management and risk screening of patients with SI in the ED

241 Developing a Computerized Adaptive Suicide Screener

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Background: Many patients treated in the emergency department (ED) are at risk for suicide, but this risk often goes undetected. A computerized adaptive test (CAT) suicide screener offers a potential solution for improving screening through highly efficient, reliable administration.

Objectives: The objective of this study was to derive a CAT suicide screener.

Methods: This observational study was completed at the University of Pittsburgh and the University of Chicago. Study participants were male and female treatment-seeking mental health outpatients between 18 and 80 years of age. The item bank contained 1008 items related to depression, anxiety, and mania, including 11 suicidality items. The 11 suicidality items were fitted to a unidimensional item response theory (IRT) model and the distribution of scores was resolved into a mixture of two normal distributions. Each depression, anxiety, and mania item was used in a separate logistic regression to predict membership in the elevated suicidal component distribution and a random forest was used for multivariate prediction. The top 100 items were included in the final item bank. A bifactor model was then fit to the 111 remaining items using subdomains of depression, anxiety, and suicidality (there were no mania items that were retained). Based on the final bifactor model, a CAT was developed following the method of Gibbons et.al. 2012.

Results: 789 subjects were enrolled; 70% were female and 30% were male. The rate of major depression was 47%. The analysis was restricted to 308 subjects with complete data. The top 100 depression and anxiety items had sensitivity of 0.81 and specificity of 0.90 (individual ORs from 2.4 to 42.0) for predicting the elevated suicidality group. All 111 items (depression, anxiety and suicide items) had high loadings on the primary suicide dimension (average = 0.67, range 0.49-0.88). CAT revealed that an average of 10 items (5-20), provided a correlation of 0.96 with the 111 item scale with precision of 5 points on a 100 point scale metric.

Conclusion: The CAT is able to accurately measure suicidal severity with an average of 10 items in approximately 2 minutes. The next stage is to administer it with a large sample of heterogeneous ED patients and to validate it against independent clinician assessment of suicidal risk and suicidal behavior within the next six months.

242 Usability of the PROMIS Assessment in an Urban Emergency Department

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Background: The NIH's Patient Reported Outcomes Measurement Information System (PROMIS) has become a gold standard for behavioral health and psychosocial assessment. While the PROMIS assessment may be well suited for the emergency department (ED) setting because the computer adaptive testing (CAT) approach is designed to maximize both efficiency and reliability, making it ideal for fast-paced settings, it has not been adequately tested in the ED.

Objectives: This study assessed the feasibility and usability of the PROMIS in an urban ED.

Methods: Patients ≥ 18 years old treated in the ED of an urban tertiary medical center were approached and offered a "computerized health survey." Six scales from the PROMIS assessment library were chosen based on their goodness of fit with the ED setting, including CATs and short-forms assessing pain interference, anxiety, depression, sleep disturbance, alcohol use and social isolation. The PROMIS assessment portal is publically available and allows the compilation of these instruments into an assessment that can be accessed on any computer connected to the internet. The RAs documented acceptance rates, completion rates, and usability issues. Descriptive statistics were calculated.

Results: Of the 822 patients who were eligible for the assessment, 498 (60.6%) accepted the offer to complete the assessment. Of the 498 who began the assessment, 477 (95.8%) completed all six scales. RAs observed 115 occasions (23.1%) of usability problems. Examples include: difficulty pressing the tablet PC buttons secondary to large fingers, general tablet PC naiveté, tapping, scrolling, and typing related issues, and the tablet being too heavy for the patient. 71 patients (14.3%) had the assessment interrupted by medical personal or family. 49 patients (9.83%) expressed readability issues, and after careful review of RA statements, this was most often due to the patient leaving their eyewear at home.

Conclusion: A large percentage of ED patients are either not appropriate for the PROMIS assessment because they are too sick or decline the offer. However, most of those who began the PROMIS scales completed them even with frequent interruptions and other usability challenges.

243 Do Emergency Department Blood Cultures Influence Antibiotic Therapy in Patients Diagnosed with Sepsis?

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Background: Obtaining blood cultures prior to antibiotic administration in emergency department patients admitted with a diagnosis of sepsis has been considered standard of care and a cornerstone of the Surviving Sepsis guidelines. Several studies in other disease states, most notably pneumonia, have questioned the utility of this practice.

Objectives: The objective of this study is to determine the impact and clinical relevance of routine blood cultures obtained in the ED for patients with the diagnosis of sepsis, severe sepsis, or septic shock.

Methods: We performed a retrospective analysis of consecutive adult patients (age 18 and older) diagnosed and treated for sepsis in an urban, academic Emergency Department between 09/2014 - 02/2015. Inclusion criteria were admission through the Emergency Department and clinical diagnosis of sepsis with routine blood cultures obtained prior to initiation of antibiotics. Blood cultures were classified as positive, negative, or contaminant. Additionally, a physician reviewed individual charts for antimicrobial sensitivities, inpatient documentation, and timing of antibiotic therapy changes in correlation with true positive blood culture results.

Results: There were 194 patients admitted through the ED with blood cultures obtained and meeting the above criteria. Of these, 45 of 194 patients (23.2%) had evidence of positive blood cultures, with 30 of the 45 positive blood cultures (15.4%) resulting in true bacteremia. Blood culture results altered antibiotic therapy in 15 patients (7.7%). Diagnoses included indwelling lines or hardware (5), pneumonia (4), complicated UTI (4), and 2 patients with possible endocarditis. For the other 15 patients with bacteremia whose therapy was not altered, cultures from other sources were positive during admission (urine, vaginal cultures, surgical cultures, etc).

Conclusion: Blood cultures obtained in patients admitted with the diagnosis of sepsis from the ED altered antibiotic therapy in 7.7% of patients. Bacteremia secondary to indwelling catheters/devices and pneumonia patients on ICU status resulted in 60% of these cases. Additional studies are needed to further delineate which ED patients admitted with the diagnosis of sepsis would benefit from blood cultures.

244 Involuntary Psychiatric Holds in Young Children

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Background: Pediatric mental health emergencies are a common and growing reason for ED visits. In Los Angeles, involuntary psychiatric holds are placed on children as young as 4 years of age. There are no data in children demonstrating that involuntary holds improve outcomes. Little is known about the epidemiology of young children placed on holds.

Objectives: Our objective was to characterize young patients on psychiatric holds.

Methods: This is an interim analysis of a retrospective descriptive study of preadolescent patients on involuntary psychiatric holds in one academic ED. All visits of 4-8 year old patients on holds over a 20-month period were included. Chart abstraction was performed by the principal investigator (PI) and senior author (after training by the PI), both pediatric ED attendings. The study was approved by the IRB.

Results: 185 visits were reviewed. 148 (80%) of the visits were by males. 49 (26%) were by patients in foster or congregant care. 74 (40%) were by patients with documented current or past child protective services involvement. 104 (56%) of visits were by patients receiving outpatient mental health care, 73 (39%) by patients on outpatient psychiatric medications, and 45 (24%) by patients with a prior psychiatric hospitalization. 168 (91%) of holds were initiated in the prehospital setting. Danger to self was noted in 148 (80%) of holds, danger to others in 115 (62%) and grave disability in 5 (3%). 94 (51%) visits resulted in discharge home rather than transfer to an inpatient psychiatric facility.

Conclusion: Our ED evaluated a significant number of young children on psychiatric holds. Most holds were for danger to self and/or others and were placed in the prehospital setting. Just over half of visits resulted in discharge home. Although the literature is sparse, young children rarely have the means to seriously harm themselves or others and suicide or perpetration of homicide by young children is an extremely rare event. Young children in particular could potentially be managed as outpatients if appropriate urgent intensive mental health services were readily available. Most patients had contact with child protective services or known psychiatric disease. Further study is needed to determine if intensive outpatient services could prevent psychiatric emergencies or replace the need for involuntary psychiatric hospitalization in these high risk young patients.

245 Resuscitative Endovascular Balloon Occlusion of the Aorta in Pediatric Trauma Patients

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Background: Resuscitative endovascular balloon occlusion of the aorta (REBOA) has received increasing attention for critically uncontrolled hemorrhagic shock, however, the efficacy of REBOA in pediatric patients is unknown. Resuscitative thoracotomy with aortic cross-clamping (RT) is often used in the similar situation.

Objectives: We compared the mortality in pediatric patients with severe injury who received REBOA to those who received RT. We hypothesized that REBOA placement is associated with better survival compared to RT.

Methods: We analyzed observational prospective data from the Japan Trauma Data Bank (JTDB) from 2004 to 2014 to compare the mortality between two groups. We included all patients who are younger than 18 years old and excluded patients without survival data. We used Chi square tests for categorical data and Wilcoxon's Rank Sum tests for continuous data for statistical comparisons.

Results: Of the 198,744 patients in the JTDB (2004-2014), 17,164 patients were younger than 18 years old. 2,696 (15.7%) patients without survival data were excluded. Of the remaining 14,468 patients, 35 (0.2%) patients had REBOA and 48 patients (0.3%) patients underwent RT and 5 (0.03%) underwent both. REBOA group is older than RT group (median age: 16.0 interquartile range (IQR) [15.0 to 17.0] vs 14.0 [7.5 to 16.5], p =0.004). The majority of patients experienced blunt trauma in both REBOA group and RT group. (91.5% vs 98.0%). There was no significant difference between REBOA group and RT group in terms of injury severity scores (ISS) (Median ISS [IQR]: 43.3 [33 to 57] vs 45.0 [34 to 59], p =0.865). Revised trauma score (RTS) was significantly lower in REBOA group compared to RT group. (median [IQR]): 4.83 [3.58 to 6.38] vs 0.00 [0.00 to 0.73], $p < 0.001$). The overall survival rate was 40.0% in REBOA group, which was significantly higher than the survival rate in the RT group 7.0% ($p<0.001$).

Conclusion: REBOA group and RT group had similar anatomical injury severity scores and REBOA treatment is associated with better survival. However, RT group were sicker in terms of physiologic severity score. REBOA treatment may be a reasonable alternative to RT in severely injured pediatric patients in some clinical settings. Prospective study is needed to confirm our result.

246 The Addition of S100B to Clinical Decision Rules Improves the Classification Accuracy for the Identification of Patients with Mild Traumatic Brain Injury

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Background: Clinical decision rules are routinely used in emergency departments (ED) to identify patients with traumatic brain injury (TBI). However, such rules rely upon clinical information and self-reported patient symptoms. Serum S100B has potential to improve the identification of patients at high-risk for TBI; however, research on the incremental value of incorporating S100B in clinical decision rules is limited.

Objectives: To determine whether the addition of serum S100B to clinical decisions rules improved measures of classification accuracy. We hypothesized the addition of S100B would improve the identification of intracranial hemorrhage.

Methods: We analyzed data from a previously conducted multi-center study of patients with mild TBI who presented to one of six EDs between 2008 and 2010. For the present analyses, all study subjects had a CT scan as part of their clinical care and a detailed medical record abstraction was performed. We constructed receiver operating characteristic (ROC) curves to compare overall classification accuracy of s100B versus each decision rule and how the addition of S100B to each decision rule changed the area under the curve (AUC). Lastly, we used logistic regression to create a novel decision rule, including S100B and clinical data, to improve the AUC. Sensitivity and specificity, with corresponding confidence intervals, were calculated for each decision rule, S100B alone, and for the novel decision rule.

Results: Data from 679 patients were included in our analyses. The addition of S100B to clinical information resulted in a statistically significant improvement of the AUC compared to the New Orleans Criteria (0.53 vs. 0.69; $p<0.01$) and the Canadian Head CT Rule (0.54 vs. 0.66; $p<0.05$). In our derivation of a new decision rule, the inclusion of S100B, age older than 65, abnormal GCS, presence of memory loss, and suspected skull fracture resulted in a AUC value of 0.73.

Conclusion: The addition of S100B to existing clinical decision rules may aide in risk stratification to identify patients with positive head CT findings. A new clinical decision rule, incorporating clinical data with s100B, may improve upon existing decision rules, but requires validation in an independent sample.

247 Comparative Effectiveness of Etomidate Versus Ketamine for Rapid Sequence Intubation of Adult Trauma Patients

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Background: Induction doses of etomidate during rapid sequence intubation (RSI) cause transient adrenal dysfunction, but whether this negatively impacts clinical outcomes in trauma patients is unknown. Ketamine does not interfere with adrenal function and therefore may be a safer induction agent.

Objectives: To evaluate the morbidity and mortality associated with the use of etomidate versus ketamine for RSI of adult trauma patients.

Methods: Our institution made a protocol switch in late 2012 from the use of etomidate to ketamine for RSI of trauma patients. We conducted a single-center retrospective comparative effectiveness study of trauma patients ≥ 18 years who were intubated in the ED with either

Outcome	Etomidate(n = 219)	Ketamine(n = 349)	Unadjusted Result (95% CI)	Adjusted Result (95% CI)
In-hospital mortality, n (%)	37 (16.9%)	66 (18.9%)	OR: 1.21 (0.81-1.81)	aOR: 1.15 (0.67-1.98)
Ventilation-free days, median (IQR)	26.2 (15.82- 27.45)	26.6 (17.18-27.51)	OR: 1.15 (0.88-1.51)	aOR: 1.08 (0.80- 1.46)
ICU-free days, median (IQR)	25.0 (15.8-27.2)	25.0 (15.9-27.0)	OR: 0.97 (0.74-1.27)	aOR: 0.89 (0.66-1.21)
Vasopressor use, n (%)	87 (39.7%)	157 (45.0%)	OR: 1.27 (0.92-1.74)	aOR: 1.30 (0.90- 1.87)
Hospital-acquired sepsis, n (%)	63 (28.8%)	85 (24.4%)	OR: 0.70 (0.49-0.99)	aOR: 0.85 (0.57- 1.29)
Hospital LOS (days) among survivors, median (IQR)	7.7 (2.9-13.9)	6.8 (2.6-14.0)	β= -0.92 (-0.28 to 0.86)	β= -0.56 (-2.13 to 1.02)
Time-to-death (days) among those who died, median (IQR)	2.03 (0.37-5.29)	1.84 (0.42-4.55)	β= -0.48 (-2.36 to 1.40)	β= 0.42 (-1.48 to 2.31)
Successful first pass intubation, n (%)	199 (90.9%)	317 (90.8%)	OR: 1.00 (0.55-1.79)	n/a
Cricothyroidotomy, n (%)	1 (0.46%)	1 (0.29%)	OR: 0.63 (0.04-10.07)	n/a

Table 247: Upchurch.

etomidate or ketamine between Jan. 2012 and Dec. 2014. Outcomes included in-hospital mortality, mechanical ventilation-free days to day 28, ICU-free days to day 28, vasopressor use up to day 28, hospital-acquired sepsis up to day 28, hospital length-of-stay (LOS) among survivors, time-to death among those who died, successful first-pass intubation, and need for cricothyroidotomy. Adjusted analyses (controlling for age, gender, heart rate, blood pressure, injury severity score, GCS, and mechanism of injury) were performed with multivariable logistic regression for dichotomous outcomes, ordered logistic regression for ICU-free and ventilation-free days, and linear regression for hospital LOS and time-to-death.

Results: 568 patients were analyzed, including 219 (39%) with etomidate and 349 (61%) with ketamine. Baseline characteristics, including age, presenting vital signs, injury severity score, GCS, and injury mechanism, were similar between the groups. Clinical outcomes between the etomidate (referent) and ketamine groups are displayed in the table; no significant differences were detected in any of the outcomes.

Conclusion: In this observational comparative effectiveness study, we found no evidence of a difference in morbidity or mortality associated with the use of etomidate versus ketamine for RSI of adult trauma patients in the ED. These results suggest similar effectiveness for etomidate and ketamine as induction agents in RSI of severely injured adults.

248 Pancuronium Improves Survival in a Rat Model of Severe Parathion Poisoning

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Background: Apart from acute cholinergic toxicity, patients that survive acute organophosphorus (OP) pesticide poisoning develop develop neuromuscular weakness (termed the Intermediate Syndrome - IMS) in about 25% of cases. In previous studies we've demonstrated that adding pancuronium to comprehensive medical treatment can preserve nicotinic acetylcholine receptors at the neuromuscular junction. The clinical implications of these studies has not been investigated.

Objectives: Our objective was to determine the effect on survival of pancuronium treatment with comprehensive medical therapy in a novel rat model of severe parathion poisoning.

Methods: Rats were anesthetized with isoflurane then intubated and ventilated, followed by placement of a tunneled external jugular vein catheter. Oxygenation saturation, heart rate, and end-tidal CO2 were continuously monitored. Parathion was given via the jugular catheter at doses of 20 mg/kg x 2 (12 hours apart), 40 mg/kg, or 60 mg/kg. When bradycardia (defined as a decrease of 50% in baseline heart rate) occurred, atropine was given in bolus dose of 0.6 mg/kg followed by a infusion of 250 mcg/kg/h along with 0.125 mg/kg midazolam IV every 4 hours as well as pralidoxime (2-PAM) 90 mg/kg IV administered every 6 hours. Rats were randomized to receive saline placebo or pancuronium 19 mg/kg IM every 3 hours. 24 hours after poisoning the ventilator was stopped and the rats were extubated. Atropine infusion was contined after extubation for 48 hours in a freely-moving infusion cage. Rats were then observed daily. Survival was defined as alive at day 8 post-poisoning. Survival rates were compared by chi-square test.

Results: Animals that received comprehensive therapy plus placebo had 8-day survival rates of 33%, 35%, and 25%, for the 20 mg/kg x2, 40 mg/kg, and 60 mg/kg doses, respectively. Animals that also received pancuronium had 8-day survival rates of 75%, 61%, and 50%, respectively. The change in survival was statistically significant at all parathion doses ($P<0.05$).

Conclusion: In this new model of severe parathion poisoning the addition of pancuronium to comprehensive medical treatment lead to a statistically significant increase in survival. Further studies to determine the dose, timing, and duration of pancuronium therapy are currently underway.

249 Risk Factors for Undertriage of Serious Trauma in Patients Aged 65 and Older Presenting to the Emergency Department

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Background: Background: EAST and ACS/COT guidelines recently suggested lowering the threshold for full trauma team activation (FTTA) elderly trauma patients (age 65 and older).

Objectives: Objectives: To determine the risk factors for no FTTA in elderly patients presenting to our ED with serious trauma

Methods: Methods: Retrospective study of consecutive elderly trauma patients presenting to a tertiary-care academic Level I trauma center with an ICD-9 code from 800 through 959. We defined serious trauma as a final ED diagnoses with serious morbidity or mortality: multiple rib fractures, pneumo- or hemothorax, intracranial bleed, long bone fractures, spinal cord injuries and vertebral fractures/dislocations. Our outcome was serious trauma with no FTTA. We present results as odds ratios (OR) with 95% confidence intervals (95%CI). Statistical significance was set $P=0.05$. We used Stata statistical software for all analyses (version 13, Stata Corp, College Station, TX).

Results: Results: From 9/3/12 and 8/31/13, 395 elderly patients were identified. Median age 83 (IQR [75, 89]), 229 (58%) were female; Asian 89 (22.5%), Black 22 (5.6%), White 276 (69.9%) and other 8 (2.0%). Mechanism of injury included: ground level falls 204 (51.7%), steps - including stairs ladders and chairs -72 (18.2%); multilevel falls 54 (13.7%); motor vehicle accidents 15 (3.8%) and pedestrian or cyclist struck 38 (9.6%) The majority of patients were brought by EMS 333 (84.5%), 84 of these 333 patients (25.2%) who arrived by EMS were called in as trauma notifications. FTTA occurred in 104 (26.4%) cases; a

trauma consult was called in 71 (18.0%). Two patients died in the ED; 377(95.4%) were admitted to hospital; 2 (0.51%) patients were transferred to another institution, and 14 (3.5%) were discharged home. Serious trauma was present in 259 (65.6%) of patients. In the model adjusted for age, sex, white race and mechanism of trauma, arrival by private means increased the odds of no FTTA for older patients with serious injuries OR 2.1 (95% CI[1.2, 3.8]). This risk was also increased for any of the mechanisms of injury excluding stairs or being a pedestrian/cyclist struck, OR 4.0 (95% CI [2.3, 6.9]).

Conclusion: Conclusions: Patients age 65 years and older who arrive to the ED with trauma by private means and mechanism of injury unrelated to vehicular trauma or steps are at increased risk of not receiving appropriate FTTA.

250 Serum Brain Derived Neurotrophic Factor Levels are Associated with Intracranial Hemorrhage in Traumatic Brain Injury Patients

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Background: Serum brain derived neurotrophic factor (BDNF) levels are decreased in acute traumatic brain injury (TBI). BDNF is released from post-synaptic membranes in an activity-dependent manner, and it is important for neurogenesis and neuronal survival. However, the mechanisms underlining decreased expression of BDNF in TBI are not well understood.

Objectives: We investigated whether day-of-injury serum BDNF levels are independently associated with intracranial hemorrhage in acute TBI.

Methods: Head Injury Serum Markers for Assessing Response to Trauma (HeadSMART) is a prospective cohort of ED patients evaluated for TBI who meet the ACEP criteria for receiving a head CT scan. Serum samples were obtained within 24 hours of injury. BDNF was measured using a commercially available electrochemiluminescent sandwich immunoassay (ELISA). Head CT scans were performed at the discretion of treating clinicians and read by board-certified neuroradiologists. Differences in BDNF values between subjects with and those without intracranial hemorrhage were assessed with a Kruskall-Wallis test. A logistic regression model adjusted for potential confounders (age, history of depression and prior concussions) was used to assess the association between BDNF and head CT findings. BDNF values were log-transformed prior to inclusion in the model.

Results: Among 201 TBI subjects who had BDNF levels measured, 16.4% (33) had evidence of intracranial hemorrhage on head CT scan. Median day-of-injury BDNF values (in ng/ml) were lower in subjects with intracranial hemorrhage (1.97 [IQR: 0.36 - 7.41]) than in those without intracranial hemorrhage (6.98 [IQR: 2.90 - 11.92]), p=0.003. After adjusting for age, history of depression and prior concussion, BDNF remained independently associated with intracranial hemorrhage on head CT (odds ratio: 0.93 [95% CI: 0.87 - 0.99]).

Conclusion: Low serum BDNF values are independently associated with intracranial hemorrhage on head CT. Further understanding of the role of BDNF in TBI may yield novel diagnostic and therapeutic strategies.

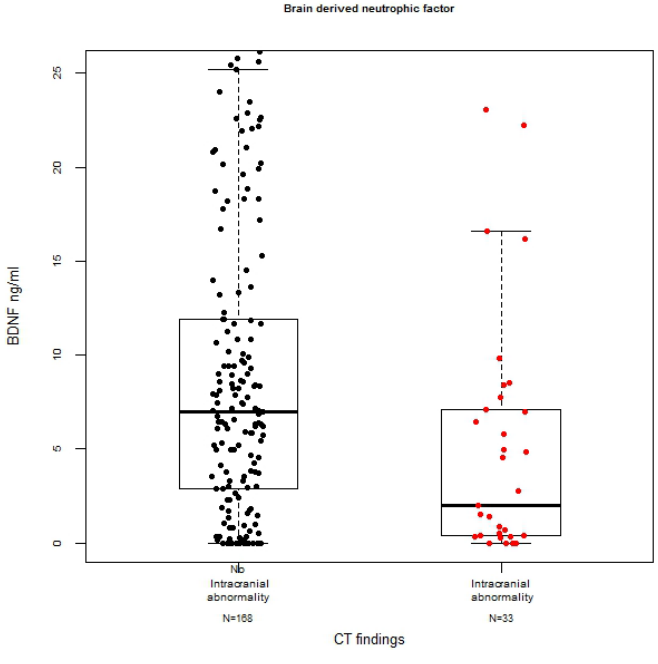

Figure 250 – Korley

251 Analysis of the Impact of Cardiopulmonary Comorbidities and Medications on the Development of Post Intubation Hypotension

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Background: Hypotension is a recognized potential complication of ED rapid sequence intubation (RSI). Little study regarding the cardiopulmonary comorbidities and medications that may contribute to the development of post-intubation hypotension (PIH) has been performed.

Objectives: We hypothesized that preexisting cardiovascular or pulmonary disease and the use of antihypertensives and systemic steroids may contribute to the development of PIH, and aimed to determine the association of specific comorbidities and medications with the development of PIH.

Methods: A retrospective cohort study of a random sample of patients who underwent ED RSI at a tertiary care academic medical center between 5/1/2011 and 2/28/15 was performed. All data were extracted from the electronic medical record by trained personal. Exclusion criteria were age < 18, use of vasopressor medication pre-RSI, and pre-RSI hypotension, defined as SBP < 90 mm Hg pre-RSI. PIH was defined as SBP < 90 mm Hg documented within 60 minutes of RSI or use of a vasopressor during this time. The comorbidities and outpatient medications analyzed were asthma, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), hypertension (HTN), and use of systemic steroids, ACE inhibitors, beta blockers, and calcium channel blockers (CCB). Multiple logistic regression analysis was used to calculate the OR and 95% CI for each of these variables for the development of PIH.

Results: 239 patients met the inclusion criteria and had complete data for analysis. PIH occurred in 46 (19%) of these patients. Among the cohort 15% had a history of asthma, 8% had CHF, 21% had COPD, 49% had HTN, 11% were on systemic steroids, 24% on ACE inhibitors, 28% on beta blockers, and 17% were on CCBs. Only outpatient systemic steroid (OR 15.64, 95% CI: 4.20-58.18) and CCB use (OR 3.32, 95% CI: 1.44-7.67) were significantly associated with PIH.

Conclusion: Of the factors studied, only outpatient use of systemic steroids and CCBs were associated with an increase in the risk of PIH. While ED physicians should always be mindful of the potential for development of PIH, particular caution is warranted in patients who have received these agents as outpatients. Further, large prospective studies, and exploration of the mechanisms responsible for these findings, are needed.

252 Can We Decrease the Pain of Peripheral Intravenous Line Placement in Adults by Vapocoolant Spray? A Prospective, Randomized, Blinded, Placebo-Controlled Trial

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Background: Painful procedures such as peripheral intravenous line placement (PIV) are common in emergency departments (EDs). Previous studies indicate practitioners provide inadequate analgesia for patients with painful conditions and fail to use anesthetics before doing painful procedures.

Objectives: To determine if vapocoolant is effective and safe in adult ED patients. We hypothesize vapocoolant will decrease the pain of PIV placement and is safe with no permanent skin abnormalities.

Methods: Prospective, blinded, randomized, placebo-controlled efficacy and safety trial of vapocooolant spray on pain in adults undergoing PIVs randomized to sterile water spray (S) or vapocoolant (V) spray (1,1,1,,3,3, pentafluoropropane and 1,1,1,2 tetrafluoroethane, Gebauer Pain-Ease ®) in a large urban tertiary care hospital ED. Numeric rating scale (NRS) 0 -10 was done after spray application and PIV placement. Safety assessment included vital signs (VS); a checklist for pallor, erythema, etc. and skin photographs before and after spray application/PIV. Side effects were noted. NRS: S vs. V was compared by the Mann-Whitney test.

Results: Of the 300 adults: S =150, V =150; demographic, comorbidities, medications, VS were not significantly different for the 2 groups. Mean age (years) was S 48, V 54; males S 43%, V 40%; Caucasian S 40%, V 42%; Non-Caucasian S 60%, V 58%;.Median NRS [P25, P75] after PIV line placement was S 4 [2,7] vs. V 1 [0,3] ($p< 0.001$). Mean NRS after PIV line placement was S 4.4 (± 3.0), V 1.9 (± 2.4) ($p < 0.001$). After PIV placement, no pain was reported by 9% S patients, 45% V patients Before and after photographs post spray/PIV placement found no skin abnormalities. The 5 minor complaints all resolved quickly: one S patients felt cool and 3 V patients felt cool and 1 complained of redness/discomfort.

Conclusion: Vapocoolant is safe and effective in decreasing the acute pain of PIV placement in adults in the ED with a significant decrease in the NRS compared to placebo with no lasting visible skin abnormalities.

253 Systematic Review of the Use of Low-Dose Ketamine for Analgesia in the Emergency Department

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Background: Ketamine is a popular sedative agent for painful procedures. It is not widely used at sub-dissociative analgesic doses in the emergency department (ED).

Objectives: We sought to determine the performance of low-dose ketamine (LDK) as an analgesic for acute pain management in adult patients in the ED.

Methods: We systematically reviewed electronic databases (MEDLINE, EMBASE, AMED, CINAHL, PubMed and Cochrane database of systematic reviews), grey literature, conference proceedings and clinical trials registries. Two independent reviewers identified eligible studies using pre-determined criteria. We included peer-reviewed studies that used LDK (< 1 mg/kg IV or < 2mg/kg IM) in adult patients (>18 yo) requiring acute pain management for any condition in the ED. Our outcome measures included analgesic effect of LDK compared to any opioids, need for rescue analgesia, and neuropsychological adverse events. We assessed inter-rater agreement using kappa statistics, risk of bias using the Cochrane Collaboration's Tool, and propose a treatment recommendation using GRADE. Heterogeneity among studies precluded meta-analysis.

Results: We reviewed 1,408 studies and selected 44 for full review (kappa = 0.70). Thirty-three were excluded due to wrong patient population and non-analgesic use of ketamine. Eleven studies with 1,249 participants were included - six randomized control trials (RCTs) and five observational studies. All of which had an overall low risk of bias. There was extensive variation in the dose and route of LDK used (0.1 - 0.7 mg/kg SC/IV/IM), administration protocols, and use of adjunct analgesia. There is a lack of high quality data regarding the use of LDK as an analgesic agent in the ED. However, the current moderate quality data demonstrates a significant analgesic effect of LDK with occasional need for rescue analgesia and neuropsychological adverse events. Commonly reported neuropsychological adverse events included dizziness, dysphoria, and confusion, rarely agitation or hallucinations. All adverse events were self-limited or occasionally required benzodiazepines for resolution.

Conclusion: Our GRADE evidence table identified moderate quality evidence from six RCTs supporting the analgesic effect of LDK for acute pain management in the ED when compared to using opioids alone.

254 Effect of Pharmacist Education on Adherence to an Analgosedation Protocol for Post-Intubation Sedation in the Emergency Department

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Background: The 2013 Society for Critical Care Medicine guidelines on the management of intubated patients emphasize the use of an intermittent, analgesia-first strategy - analgosedation.

Objectives: Our objective was to measure adherence to an analgosedation protocol in intubated patients in the ED after pharmacist-led education of ED staff. We hypothesized that pharmacist-led education would increase adherence to the analgosedation protocol in intubated ED patients.

Methods: We conducted a retrospective observational study of all adult intubated patient visits in a single ED Jun-Sept 2014 (pre-education) and Nov 2014-Feb 2015 (post-education). Pharmacists educated ED staff on analgosedation in Oct 2014 through didactic lectures and bedside counseling. During the post-education period, no contemporaneous counseling took place in the ED. We identified study visits based on ED airway box records cross-referenced with an electronic medical records query. Two investigators independently abstracted demographic and clinical visit data. Our primary outcome measure was adherence to the analgosedation protocol pre- vs. post-education with secondary objectives of time to sedation administration and whether presence of an ED pharmacist increased compliance with the analgosedation protocol. Using the two-sample Z-test for proportion or the Mann-Whitney U test, we report descriptive characteristics and comparison of the outcome measures pre- vs. post-pharmacist education.

Results: 97 visits met inclusion criteria (Table). There was no significant improvement in adherence to the analgosedation protocol pre- vs. post-pharmacist education or with the presence of an ED pharmacist. We also did not observe significant acceleration in time to sedation administration. Post-education, we observed a significant increase in the prevalence of some form of analgesia administration in intubated ED patients (52.9% pre- to 78.1% post-education, P=0.03).

Conclusion: Pharmacist education and presence in the ED did not increase adherence to an analgosedation protocol nor accelerate time to sedation administration. Post-education, analgesic use did increase in ED intubated patients.

Characteristics of Study Visits

Independent Variable	*Pre-Pharmacist Education Program (N=48)*	*Post-Pharmacist Education Program (N=49)*
Age - Years (Mean, Standard Deviation)	62.3, 18.9	66.9, 19.5
Sex		
% Male	54.2	49.0
% Female	45.8	51.0
Weight - Kilograms (Mean, Standard Deviation)	81, 19	74, 20
Allergies		
% Opioid (1)	6.3	14.3
% Benzodiazepine (2)	4.2	0.0
% Opioid & Benzodiazepine (1&2)	2.1	0.0
% Propofol (3)	0.0	0.0
% Other (4)	37.5	36.7
% None (5)	50.0	49.0
Past Medical History		
% Alcohol Abuse	6.3	10.2
% Seizure Disorder	12.5	6.1
%Intravenous Drug Abuse	6.3	4.1
% ICH (4)	0.0	0.0
% Seizure Disorder & ICH (2&4)	4.2	0.0
% Overdose (5)	2.1	0.0
% Other (6)	68.8	79.56
Intubated Pre-Hospital		
% No	75.0	75.5
% Yes	25.0	24.5
Intubated During Presence of ED Pharmacist		
% No	37.5	51.0
% Yes	37.5	24.5
% Not Applicable as Intubation Pre-Hospital	25.0	24.5

Figure 254 – Kuroski

Comparison of Pre- and Post-Pharmacist Education Program Outcome Measures (P-Value Last Column)

Outcome Measure	*Pre-Pharmacist Education Program (N=48)*	*Post-Pharmacist Education Program (N=49)*	*P-Value (Based on Two-Sample Z-test for Proportion or Mann-Whitney U Test (Time to Sedation Administration Comparison))*
Percentage of Visits with Physician Adherence to Post-Intubation Sedation Guideline			
% No	60.4	65.3	0.71
% Yes	35.4	32.7	
N/A	4.2	2.0	
Reason for Classification as Guideline Non-Adherence			
% No Sedation Given (Code=7)	6.5	3.0	0.52
% Continuous Infusion Initiated First (Anxiolytic or Analgesic) (Code =1)	19.4	6.1	0.11
% Intermittent Anxiolytic Initiated First (Code =2)	38.7	18.2	0.07
% Continuous Infusion Anxiolytic Initiated After Intermittent Analgesic (Code =3)	19.4	18.2	0.90
% Continuous infusion anxiolytic initiated after intermittent analgesic + anxiolytic (Code =4)	3.2	0.0	0.30
% Continuous Analgesic Initiated After Intermittent Analgesic (Code =5)	3.1	27.2	0.01
% Other (Code =6)	9.7	27.3	0.07
Percentage of Visits Administered Analgesic as Initial Post-Intubation Sedation Medication (Only Visits with ED Intubation Included)			
% No	47.1	21.9	0.03
% Yes	52.9	78.1	
Time to Post-Intubation Sedation (Minutes) (Only Visits with Administration of Sedation after ED Intubation Included			
Median, IQR	8.5, 9.3	12.5, 18.8	0.20 (Mann-Whitney U Test)
Percentage of Visits with Physician Adherence to Post-Intubation Sedation Guideline During Presence or Absence of ED Pharmacist (Only Visits with ED Intubation and Sedation Administration Included, N=35 Pre-Education, 36 Post-Education)			
% No Adherence - Yes Pharmacist Present	31.4	25.0	0.55
% No Adherence - No Pharmacist Present	42.9	50.0	0.55
% Yes Adherence - Yes Pharmacist Present	20	5.6	0.07
% Yes Adherence - No Pharmacist Present	5.7	1.4	0.08

Figure 254 – Kuroski

255 Chronic Pain Treatment Plans Reduce Opioid Administration and Emergency Department Return Visits

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Background: Over the past two decades, opioid use for both acute and chronic pain has dramatically increased, as has death from overdose of prescribed opioids. For chronic pain, the efficacy and safety of opioids has been questioned. Many EDs have implemented a Treatment Plan Program (TPP) to reduce use of opioids for chronic pain.

Objectives: We sought to measure the effect of a TPP on ED opioid administration and return visits for chronic pain.

Methods: This was an observational before/after study of 81 patients enrolled in the TPP from November 2012 to November 2014 in an urban Level 1 Trauma Center with an ED census of 105,000 adults. Patients were identified for an individualized treatment plan (ITP) if they had 4 or more visits in a 6 month period for a chronic pain syndrome, or if they had multiple opioid prescribers in the state Prescription Monitoring Program. Patients were excluded if visits were related to a complicated pain syndrome. ITP recommendations were created based on consensus best-practice guidelines and patients were notified by mail. The ITP was integrated into the EMR for easy identification by providers. Patient charts were reviewed for a period of 6 months before and after establishment of an ITP. Main outcomes were: doses of opioid analgesics administered (morphine equivalents), number of return visits, and lengths of stay before and after ITP. Differences between means were compared with a two-sample t-test or Mann-Whitney U-test as appropriate, and 95% confidence intervals were calculated for point estimates.

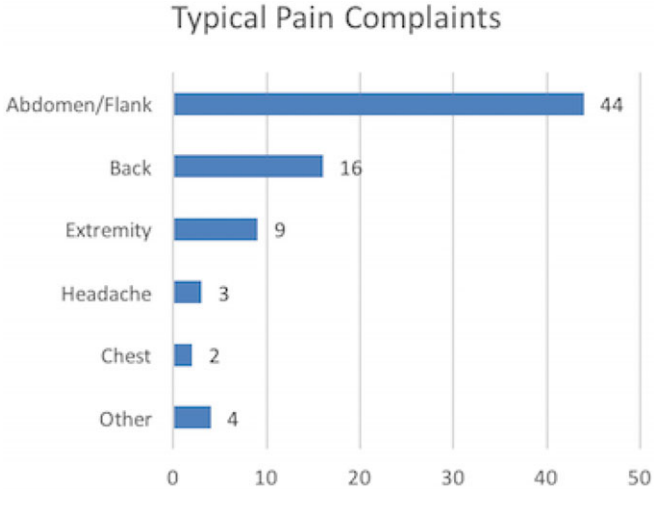

Figure 255 – Fabrizi

Opioids Administered (ME per Visit)	13.5 (95% CI 10.5-16.4)	4.5 (95% CI 2.4-6.7)	<0.001
Opioids Prescribed (ME per Visit)	22.4 (95% CI 15.3-25.4)	12.2 (95%CI 4.5-19.9)	0.034
Patient Visits	9.8 (95% CI 8.2-11.5)	4.0 (95% CI 3.1-5.0)	<0.001
Visits for Typical Pain	6.9 (95% CI 5.5-8.2)	2.3 (95% CI 1.7-2.9)	<0.001
Length of Stay (Hours)	5.2 (95% CI 4.6-5.8)	4.9 (95% CI 3.9-5.8)	0.436

Table 255: Fabrizi.

Results: Review of 81 charts identified 72 patients who met the inclusion/exclusion criteria. 50% were female, 44% had an underlying psychiatric disorder, 48% reported an analgesic allergy and only 14% had private insurance. The mean opioid dose administered in the ED decreased from 13.5 before ITP to 4.5 after ($p < 0.001$). Mean opioids prescribed dropped from 22.4 to 12.2 ($p = 0.034$). Mean patient visits decreased from 9.8 to 4.0 ($p < 0.001$). Mean length of stay was 5.2 hours before and 4.9 hours after ($p = 0.436$). Main outcomes are detailed in Table 1.

Conclusion: Initiation of a TPP was associated with a significant reduction in ED opioid use and patient visits among the targeted population. ED length of stay did not change. Future research is needed to examine the impact of opioid restriction on patient outcomes.

256 Models to Predict Hospital Admission from the Emergency Department Through the Sole Use of the Medication Administration Record

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Background: Multiple models have been developed to predict hospital admission for patients presenting to the ED. However, these tools suffer from multiple limitations including reliance on manual data entry (e.g. ED arrival mechanism), multiple types of data, and data that are not completely generalizable across institutions (e.g. triage score). An ideal solution would produce a disposition score that requires no data entry, employs variables already captured by all EDs, and provides a score far enough in advance to expedite admission processes.

Objectives: Evaluate the discriminatory power of machine learning algorithms for predicting hospital admission at two hours of ED arrival through the sole use of the medication administration record (MAR).

Methods: Our dataset included 27,757 encounters (26% admitted) from January 2013 to September 2014 and 2,109 medications encoded to RxNorm CUI numbers using MedEx. We included all medications in the MAR, including those given during prior ED visits. We employed classic and state[[Unsupported Character - Codename]]of [[Unsupported Character - Codename]]the[[Unsupported Character - Codename]]art classifiers including logistic regression, naive bayes, regularized logistic regression, classification and regression trees (CART), and linear support vector machine (SVM) with penalty parameter C. In all cases, we split the dataset into a training, validation, and test set. We used the validation set to optimize any parameters of the learning algorithm and used the test set to calculate performances. We employed 5[[Unsupported Character - Codename]]fold cross validation and reported AUC performances averaged across 5 folds.

Results: The models performed with AUCs of 0.85 for linear SVM with penalty parameter C (95%CI 0.84-0.86), 0.83 for CART (95%CI 0.82-0.84), 0.79 for regularized logistic regression (95%CI 0.78-0.80), 0.70 for Naive Bayes (95%CI 0.69-0.72), and 0.68 for logistic regression (95%CI 0.67-0.69).

Conclusion: MAR data is sufficient to reliably predict hospital admission two hours into the ED stay. Our models perform similarly to those from prior studies, but with the advantages of only requiring a single type of data and being highly generalizable to other institutions; MAR data is objective, does not require manual data entry, and is universally available across EDs.

257 Dyspnea in Acute Heart Failure: Is there an Association with Neurohumoral Activation?

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Background: Dyspnea is the most common symptom in acute heart failure (AHF). It is unknown if neurohumoral activation as measured by aldosterone (Aldo) levels is associated with severity of dyspnea at time of presentation or change in dyspnea over time.

Objectives: To determine whether (1) baseline Aldo levels are associated with severity of dyspnea at time of ED presentation (2) baseline Aldo levels correlate with changes in patient reported dyspnea.

Methods: Prospective, observational, convenience sample of 89 ED patients with signs and symptoms of AHF. Dyspnea was assessed at baseline and 48 hours by a 5-point Likert scale in both upright and supine positions, with Aldo levels measured at the same time points. A 1-point or greater change in Likert scale was considered significant. For change in dyspnea, patients were categorized as "better", "worse", or "no change." Ordered and multinomial logistic regression models tested the association between Aldo levels and dyspnea severity at baseline, and change in dyspnea at 48 hours. Co-variates were age, sex, BNP, SBP, BUN, and Hemoglobin.

Results: Of the 89 patients enrolled, 77 had AHF, 16 (20.1%) were readmitted and 2 (2.6%)died within 30 days. Average age was 64, 40% female, 77% history of HF, median BNP was 707 pg/mL (IQR 422-1423). In the upright position, 52% of patients reported minimal to no SOB (Likert score of 2 and 1, respectively). Nearly half (46.8%) of patients reported worsening SOB when supine. Baseline median Aldo level was 4 ng/dL (IQR 2-9) (Reference range 3-16 ng/dL). A significant association between baseline dyspnea and Aldo levels in the upright (OR 3.21 95%CI 1.61- 6.4) [See Pang Table] and supine positions (OR 2.19, 1.06-4.48) were seen. There was no association between change in dyspnea at 48 hours and baseline Aldo levels.

Conclusion: In this pilot study, there was a significant association between baseline Aldo levels and patient reported shortness of breath at the time of presentation to the ED.

Pang Table

Association between Baseline Dyspnea (Upright) and Baseline Aldo Levels	Odds Ratio	95% CI	p-value
Aldo Level (per SD)	3.21	1.61-6.39	0.001
Age	0.99	0.96-1.03	0.856
Sex	1.34	0.52-3.47	0.54
SBP (mmHg)	0.98	.96-0.99	0.005
BNP	1.00	1.00-1.00	0.26
BUN	0.93	0.89-0.97	0.001
Hemoglobin	0.77	0.59-1.01	0.06

Table 257: Pang.

258 The HEART Pathway Randomized Controlled Trial: One-Year Safety Outcomes

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Background: The HEART Pathway is a decision aid designed to identify emergency department (ED) patients with acute chest pain for

early discharge. Prior HEART Pathway studies demonstrate >99% negative predictive value (NPV) for adverse events at 30 days. However, ability of the HEART Pathway to predict adverse events at 1 year has not been studied.

Objectives: To determine the rate of 1 year major adverse cardiac events (MACE) for the HEART Pathway and usual care among ED patients with acute chest pain and to test whether the HEART Pathway can predict 1 year MACE.

Methods: Adult ED patients with symptoms concerning for acute coronary syndrome without ST-elevation on electrocardiogram (N=282) were randomized to the HEART Pathway or usual care. In the HEART Pathway arm, ED providers used the HEART score and troponin measures at 0 and 3 hours to identify patients for early discharge. Usual care was based on ACC/AHA guidelines. MACE was defined as death, myocardial infarction (MI), or coronary revascularization and was assessed at 1 year by phone interview, record review, and Social Security Death Index. The NPV and positive predictive value (PPV) of the HEART Pathway for MACE at 1 year were calculated. Fisher's exact tests were used to compare MACE rates among randomization arms.

Results: During the study period 282 patients were enrolled, of which 141 were randomized to the HEART Pathway and usual care arms. Participants had a mean age of 53 years and 21% (45/282) had known coronary disease (MI or revascularization prior to enrollment). MACE within 1 year of randomization occurred in 10% (29/282). Among patients randomized to the HEART Pathway 8.5% (12/141) had MACE (0 deaths, 10 MIs, 2 revascularizations without MI) at 1 year compared to usual care in which 12% (17/141) had MACE (4 deaths, 13 MIs); p=0.43. The HEART Pathway identified 47% (66/141) of patients as low-risk, of which 0% (0/66) had 1 year MACE. In the usual care arm 18% (26/141) received early discharge, with 4% (1/26) having 1 year MACE (1 death); p for comparison = 0.28. The NPV of the HEART Pathway for 1 year MACE was 100% (95%CI: 93-100%), with a PPV of 16% (95%CI: 9-26%).

Conclusion: The HEART Pathway has a high NPV for MACE at 1 year. MACE rates at 1 year were similar among the HEART Pathway and usual care arms.

259 Evaluation of Potential Disparities in Testing by Race and Ethnicity in the Emergency Department Observation Unit

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Background: A previous study reported racial disparities in physician ordering of stress testing for chest pain patients who were evaluated in an emergency department observation unit (EDOU).

Objectives: We evaluated whether similar racial/ethnic discrepancies would be present in a patient population with distinct differences in geography and racial and ethnic composition.

Methods: We conducted a prospective study of EDOU chest pain patients at an urban, academic medical center. We asked patients to self-identify their race/ethnicity using United States Census Bureau classifications. Provocative testing in the EDOU was at the discretion of the emergency physician and the consulting cardiologist. We calculated Thrombolysis in Myocardial Infarction (TIMI) scores and classified patients as low risk (score 0-2) or moderate risk (3-5). The primary outcome was the performance of provocative testing [stress testing or coronary computed tomography angiogram (CTA)] during the EDOU stay.

Results: Over the 18-month study period, 576 patients were evaluated for chest pain in the EDOU and agreed to participate in the study. 20.3% of patients self-identified as a non-White race/ethnicity. Among non-White patients, 25.6% self-identified as Hispanic, 16.2% as Black, 11.1% as Pacific Islander, 8.5% as American Indian, 3.4% as Asian, and 35.0% as Other (more than one race). White and non-White patients were similar in gender (53.2% females vs. 53.8%, p=0.920) and average TIMI score (1.9 vs. 2.0, p=0.403) while non-White patients were younger (average age 54.4 years vs. 51.5 years, p=0.036). We did not find a significant difference in rates of provocative testing between White and non-White patients: 43.6% of non-White patients underwent provocative testing compared to 46% of White patients (p=0.647). Among those with a low-risk TIMI score, 54.5% of non-White patients underwent provocative testing compared to 51% of White patients (p=0.554). When comparing those with a moderate-risk TIMI score, 62.1% of non-White patients and 61.2% of White patients had provocative testing in the EDOU (p=0.920).

Conclusion: In contrast to previous studies of cardiac testing, we did not find racial/ethnic differences in rates of provocative studies in the EDOU. Racial and ethnic discrepancies in cardiac testing may vary by practice region and setting.

260 Female Patients are Less Likely to Undergo Cardiac Catheterization in the Emergency Department Observation Unit

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Background: Previous studies have demonstrated gender differences in cardiac testing rates in emergency department (ED) patients with chest pain.

Objectives: We evaluated whether gender differences exist in rates of provocative cardiac testing and cardiac catheterization in the ED observation unit (EDOU).

Methods: We performed a prospective evaluation of patients placed in the EDOU for the evaluation of chest pain at an urban, academic medical center. We recorded baseline data, outcomes related to the EDOU stay, and events which occurred during the 30 days after the ED visit. Primary study outcomes included rates of provocative testing (stress testing or coronary computed tomography) and primary cardiac catheterization (cardiac catheterization performed during the EDOU stay without positive cardiac biomarkers or provocative cardiac testing prior to catheterization).

Results: Over the three-year study period, 1276 patients agreed to participate in the study, of whom 53.8% were female. Males and females were similar in average age (53.3 years vs. 54.5 years, p=0.095) and average Thrombolysis in Myocardial Infarction (TIMI) score (1.8 vs. 1.7, p=0.146). Rates of provocative cardiac testing were similar between males and females (54% vs. 51.8%, p= 0.439). Among those who did not undergo provocative cardiac testing, males were nearly twice as likely to undergo primary cardiac catheterization (10.3% vs. 5.7%, p=0.037). We noted a trend toward a gender difference in primary cardiac catheterization among moderate-risk patients (TIMI score 3-5): 11.8% (male) vs. 5.4% (female), p=0.056. Rates of stent placement were comparable between males and females undergoing primary cardiac catheterization (28.6% vs. 21.1%, p=0.737). We found no cases of missed myocardial infarction or unplanned intervention among either females or males in the 30 days following the EDOU stay.

Conclusion: Men and women were similar in rates of provocative testing in the EDOU, but men were more likely to be taken directly to cardiac catheterization despite similar risk factor profiles between genders. Our findings suggest that gender differences in EDOU testing may be manifest by more aggressive testing among male patients. Whether such a disparity leads to adverse outcomes or unnecessary intervention requires further investigation.

261 Involving Patients with Low-Risk Chest Pain in Discharge Decisions: A Multicenter Trial

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Background: In a prior single-centered trial we demonstrated the efficacy of the Chest Pain Choice decision aid (CPC) to improve patient knowledge and decrease resource use.

Objectives: In this study we test the effectiveness of CPC in 6 geographically diverse EDs across the U.S.

Methods: This was a two-arm, patient-level randomized trial. Adults (> 17 years of age) with chest pain being considered for observation unit (OU) admission for cardiac stress testing or coronary CT angiography (CCTA) were randomized to an intervention group receiving CPC or to usual care. The decision aid included a 100-person pictograph displaying the 45-day risk of acute coronary syndrome and the available management options (OU admission and stress testing, CCTA, or 24-72 hour follow-up). The patient advisory group selected patient knowledge as the primary patient centered outcome. Additional outcomes included decisional quality as measured by the decisional conflict scale (DCS), frequency of cardiac testing, and safety (30-day rate of major adverse cardiac events [MACE]). Outcomes were assessed by post-visit survey, medical record review, and 45-day phone follow-up.

Results: We randomized 910 patients (455 CPC, 455 usual care) over 21 months. The groups were balanced with regard to age, sex, and cardiac risk factors. Mean (S.D.) age was 47.6 (18.4), 539 (60%) were female, 311 (34%) African American, 405 (45%) had a history of hypertension, 134 (15%) diabetes, and 363 (40%) a family history of cardiac disease. Compared to usual care, patients in the CPC arm had greater knowledge (53.0% versus 44.6% questions correct, mean difference [MD] 8.4%, 95% CI 5.9-10.9, $p < 0.001$) and less decisional conflict (DCS 43.6 versus 46.4, MD -2.7, 95% CI -4.8 to -0.7, p=0.01). The frequency of cardiac stress testing was significantly lower in the intervention arm (37.4% versus 46.3%, absolute difference 8.9%, p=0.007). There was 1 MACE in the intervention arm; this patient was initially admitted to the hospital from the ED, had a negative stress test, and experienced an AMI after discharge.

Conclusion: Use of a decision aid increased patient knowledge and decisional quality and safely decreased resource use. Implementation studies are needed to facilitate uptake in practice.

262 Multivariate Analysis of 30-Day Readmission for Acute Myocardial Infarction

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Background: To avoid unnecessary hospital readmissions, ED physicians are often asked to hold rebounding patients in an observation status in the ED. By addressing the root causes of readmission need, return ED visits and extended observations might be reduced. Prior studies have looked at readmission rates for Medicare patients or readmission rates for specific health systems. We explore readmission for all patients and all health systems across a large geography.

Objectives: Evaluate the frequency and root causes of 30-day readmission for acute myocardial infarction (AMI).

Methods: A multi-center retrospective cohort study based on 2013 discharge data from all licensed hospitals in California. Multivariate logistic regression analysis was used to compare patients who were and were not readmitted within 30 days based on demographic characteristics, payer, comorbidity, and length of stay (LOS) at index visit.

Results: Of the 3.8 million ED visits during the study period, 36,202 visits met inclusion criteria. The 30-day readmission rate was 14.7%, with significant heterogeneity between cohorts. 58.4% were Medicare, with a 16.7% readmission rate. 31.4% were readmitted to a different hospital than their index visit. In multivariate analysis, clinical variables associated with readmission included comorbidity index (CMI) > 2 (OR 2.44, 95%CI 2.21-2.69) and CMI = 2 (OR 1.69, 95%CI 1.51-1.89) compared to CMI = 0, and LOS > 7 days (OR 1.66, 95%CI 1.53-1.80) compared to LOS 1-3 days. Compared to private insurance both Medicaid (OR 1.92, 95%CI 1.71-2.16) and Medicare (OR 1.43, 95%CI 1.30-1.57) are associated with increased readmission. Modest associations were found for non-Hispanic black (OR 1.33, 95%CI 1.19-1.48) and Hispanic (OR 1.16, 95%CI 1.08-1.26) compared to non-Hispanic white, and female (OR 1.12, 95%CI 1.05-1.19) compared to male.

Conclusion: A substantial portion of subjects were not covered by Medicare and presented for readmission to a different facility and therefore may be excluded from individual health system analysis. Clinical variables have the strongest association with 30-day readmission and potentially offer the best opportunity to reduce readmission burden; however demographic variables, including ethnicity, gender, and payer are also positively associated with readmission.

263 Comparison of Malpractice Claims Involving Emergency Medicine Residents to Attending-Only Claims

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Background: Data are lacking on how EM resident involvement in malpractice claims differs from attending only claims.

Objectives: Compare factors involved in claims where a resident is involved to those that are attending only.

Methods: We used CRICO's Comparative Benchmarking System to analyze open and closed EM claims and suits asserted from 2009-2013. The CBS database contains professional liability data on > 400 hospitals and > 165,000 physicians, representing > 30% of all malpractice cases in the U.S. We compared cases naming residents (either alone or in combination with an attending) to those that were attending-only and reported case statistics, categories, severity, procedural data, diagnoses and contributing factors. Fisher's exact test or t-test were used for comparisons (alpha set at 0.05).

Results: 732 cases were identified; 113 (15%) included an EM resident. Most frequent allegation categories were failure or delay in diagnosis/misdiagnosis and medical treatment (non-surgical procedures

Summary Table

Main Categories	Sub-Categories	Resident Cases n=113	Attending Cases n=619	P Value
Procedures	Procedure Involved	32% (36)	26% (188)	0.17
	Vascular access	2.7% (3)	0.1% (1)	<0.008
	Spinal procedures	3.5% (4)	1.1% (8)	<0.04
Final Diagnoses	Cardiac related	19% (21)	10% (71)	<0.005
	Complications in Care	13% (13)	12% (90)	0.769
Contributing Factors	Clinical Judgment	71% (80)	76% (556)	0.24
	Communication	27% (30)	30% (219)	0.46
	Documentation	20% (23)	21% (151)	0.95
	Technical Skills	20% (22)	13% (96)	0.07

Table 263: Gurley.

or treatment regimens i.e. central line placement). Resident cases incurred less on average $51,163 vs $156,212 per case. Allegations of safety/security, patient monitoring, policy and procedure, breach of confidentiality and provider behavior were found in the attending cohort only. 66% (75) of resident vs 57% (415) of attending cases were high severity claims (permanent, grave disability or death) (p=0.052). Procedures were involved in 32% (36) of resident and 26% (188) of attending cases (p=0.17). The most common final diagnoses for resident and attending cases respectively were cardiac related 19% (21) vs 10% (71), p<0.005. Common contributing factors in resident and attending cases were clinical judgment 71% vs 76% (p=0.24); communication 27% vs 30% (p=0.46); and documentation 20% vs 21% (p=0.95). Technical skills contributed in 20% (22) of resident versus 13% (96) of attending cases (p=0.07).

Conclusion: Payments incurred in attending only cases have higher payouts and cases more commonly relate to behavior issues, while resident claims are more likely to involve technical skills and cardiac related outcomes. Clinical judgment, communication and documentation are the most prevalent contributing factors in all cases, and may be targets for risk-reduction strategies.

264 Use of an Interactive Just-in-Time Checklist Tool Improves Technical Performance and Team Communication During Transvenous Pacemaker Performance in Simulated Patients: A Randomized, Controlled Trial

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Background: Rapid performance of critical procedures is an essential component of emergency medical care. Both skill decay and deficiencies in team communication and coordination can contribute to procedure-related errors. An interactive, checklist-based intervention to mitigate these factors could lead to improvements in procedural performance and patient safety. The Just-in-Time (JIT) training model offers an ideal format to deliver this training.

Objectives: To determine the impact of a JIT training intervention on insertion of a transvenous pacemaker (TVP) in a simulated patient scenario.

Methods: We conducted a prospective, randomized, non-blinded, controlled trial to evaluate a JIT training intervention in a simulated scenario of unstable bradycardia. Subjects were emergency medicine attendings at 2 academic medical centers affiliated with the same university. To establish baseline performance, all subjects completed a TVP simulation and were assessed. Between 4 and 12 months later, subjects were randomized to either JIT intervention or control conditions. Subjects then repeated the TVP simulation and assessment. The primary outcome was the assessment score for technical procedure performance, consisting of a 36-point checklist that included anchored behavioral assessment ratings generated from prior literature and subject-matter expert opinion. The secondary outcome was teamwork behavior score as assessed by the Mayo High Performance Team (MHPT) Scale. Student's t-test was used to assess for statistical significance in outcomes.

Results: Twenty-nine subjects were enrolled, and 27 completed the study (93.1%). The JIT intervention was associated with significantly improved technical procedure performance and MHPT scores (see Table 1).

Conclusion: Use of a JIT training intervention improves technical scores and team performance of TVP insertion during a simulated critical patient encounter. Further research into the application of this intervention in clinical care is needed to determine if it leads to improved patient outcomes.

Table 1. Technical and Mayo High Performance Team scores observed in the experimental group (n=14) and the control group (n=13).

	Experimental Group Mean (SD)	Control Group Mean (SD)	Mean Difference [95% CI]	t(df)*	p value
Technical Scores: Preparation	4.57 (0.51)	3.08 (1.04)	1.49 [0.82, 2.17]	t(17.255) = 4.687	<0.001
Troubleshooting	4.14 (1.23)	2.15 (1.07)	1.99 [1.07, 2.91]	t(25) = 4.467	<0.001
Capture	4.93 (0.27)	2.31 (0.85)	2.62 [2.09, 3.15]	t(14.169) = 10.584	<0.001
Post-Procedure	4.86 (0.36)	2.15 (0.8)	2.70 [2.21, 3.19]	t(25) = 11.44	<0.001
Overall Performance	4.57 (0.51	2.46 (0.66)	2.11 [1.64, 2.58]	t(25) = 9.31	<0.001
Mayo High-Performance Team Score	13.71 (0.83)	10.38 (1.39)	3.32 [2.40, 4.26]	t(19.269) = 3.30	<0.001

Student's t-test was used to determine significance

Table 264: Branzetti.

265 Improving Emergency Department Discharge Through a Simple Algorithm Designed for Residents in Training: The R2D2 Disposition Protocol

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Background: We developed a simple algorithm to guide residents through the critical elements of emergency department (ED) discharge using the mnemonic "R2D2" which stands for **R**eassess the patient, **R**echeck the workup, **D**iscuss the disposition plan with the attending and finally **D**iscuss the discharge plan with the patient

Objectives: The aim of the study was to increase patient understanding of discharge instructions through the development of a protocol that is easy to learn, remember and implement by residents

Methods: This study took place in the ED at a county hospital with a 3-year emergency medicine residency training program. Data collection took place over a two week period, one week before (control group) and one week after (intervention group) implementation of the R2D2 protocol. The ED was staffed with research assistants twenty-four hours a day. Only patients who were discharged by a resident were recruited if they did not meet the following exclusion criteria such as age less than 18 years, from jail, psychiatric complaint, and no telephone for follow-up. Data collection at the time of discharge and during telephone follow-up one week after discharge focused on the patient's understanding of their discharge diagnosis and instructions.

Results: A total of 312 patients were consented, 164 in the control group and 148 in the intervention group. 73.8% (121/164) of the control group patients and 77.0% (114/148) of the intervention group patients completed the follow-up. Of these patients, 77% (89/121) of control group patients versus 88% (100/114) of intervention patients knew their discharge diagnosis (p=0.0062). 67% (81/121) of control patients versus 80% (91/114) of intervention patients knew their discharge treatment plan (p=0.0259).

Conclusion: The R2D2 protocol is easy to learn, remember and implement, providing a simple framework to guide physicians in training in the critical elements required of emergency physicians when they discharge patients from the ED. This intervention resulted in significant increases in patient understanding of their diagnosis and treatment plan. The safeguards provided by the R2D2 protocol may have many other benefits such as increased patient compliance to follow-up care, decrease in hospital expenditures associated with unscheduled ED return visits, and improved patient satisfaction.

266 Distribution of Honors Grades Across 4th Year Emergency Medicine Clerkships

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Background: Grades during EM rotations are a key factor in resident selection, yet the variability in grading is not well understood.

Objectives: To identify the current grade distribution of fourth-year EM US medical school clerkships.

Methods: This was an observational study at an EM residency program. We identified grade distributions by reviewing Standard Letter Of Evaluation (SLOE) from individuals applying to our residency program for the 2016 match. Data extracted from SLOEs included clerkship site, whether or not an EM clerkship was required, the total number of students completing clerkships, and the grade distribution from the previous year. Descriptive statistics of proportions, standard deviations (SDs), and p-value were calculated.

Results: A total of 1,075 applications from 236 individual clerkships were reviewed. Thirty-four programs did not give an honors grade during the previous year. Four of these programs distributed a highest grade of "high pass" and 30 gave only "pass" and/or "fail." Of the remaining 202 programs, the percent of grades that were given as honors ranged from 1% to 87% with a mean of 25% (SD 17.2). Of the 202 programs that granted honors grades, 63 (31.2%) sites gave between 1-14.9% honors grades, 69 (34.2%) gave 15-29.9% honors grades, 27 (13.4) gave 30-44.9% honors grades, and 24 (11.9%) programs gave greater than 45% of their students honors. Medical schools required an EM rotation at 82 (40.6%) sites. Among these programs, honors grades were given to 24% of students (SD 16.7) with a range of 4-85% while programs that did not require clerkships gave an average of 26% honors (SD 17.5) with a range of 1-87% and a p-value of 0.54.

Conclusion: Honor grades vary markedly across US fourth-year EM clerkship sites. EM clerkship requirement does not affect honor percentages. A minority of sites only give pass/fail grades. This study was limited as it is unknown how many EM clerkships currently exist and therefore participation is impossible to gauge. Additionally, only applications to a single EM program were analyzed which could introduce bias. However, clerkship sites from 236 programs likely covers the majority of clerkships.

267 Is Tolerance of Ambiguity Associated with Emergency Medicine Clerkship Performance?

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Background: Emergency medicine is a high stress, ambiguous and variable environment. Some medical students thrive in this environment, while others do not. Intolerance of ambiguity is defined as perceptual personality variable where the individual has resistance to reversal, the early selection of one solution in an ambiguous situation; a rigid, black-white view of life; and seeking certainty.

Objectives: Given the prevalence of ambiguity in the practice of emergency medicine, it is hypothesized that tolerance of ambiguity may correlate with fourth year emergency medicine clerkship performance. The objective of this study is to identify an association between tolerance of ambiguity and emergency medicine clerkship performance.

Methods: One-hundred and forty-five medical students completed the Tolerance of Ambiguity Score (TAS) prior to starting their 3rd year. Analysis of variance (ANOVA) was performed to analyze differences between student TAS and final grade in the fourth year required emergency medicine clerkship (Honors, High Pass, Pass). In addition, a Pearson's correlation coefficient analysis was performed to examine association between numeric clinical evaluation scores and TAS scores, as well as between overall clerkship percentage grades (combining clinical and exam scores) and TAS scores.

Results: ANOVA showed no significant differences between final grade groups (Honors, High Pass, Pass) in regard to tolerance of ambiguity scale score ($F(2,142)=0.722$, $p=0.488$). In addition, there is no evidence of association between TAS scores and the clinical evaluation scores ($R=0.042$, $p=0.614$, $n=145$), or between TAS scores and the overall percentage grades ($R=0.055$, $p=0.515$, $n=145$).

Conclusion: Medical students who are more tolerant to ambiguity do not perform better in a fourth year emergency medicine clerkship in regards to clinical evaluation scores, clerkship percentage grade or final clerkship grade.

268 Asthma and Asthma-Mimicking Pediatric ED Revisit Within Three Days of an ED Discharge

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Background: Return ED visits have been identified as a measure of quality of care in the asthma management. Return visits for asthma is estimated to be 5-30% in pediatrics. No published reports to date have examined the patterns of return visits across the age groups of pediatric patients with asthma or asthma-mimicking diseases.

Objectives: The objectives of this study is to describe the demographics and visit characteristics of children who were treated in California EDs for asthma and asthma-mimicking conditions who had a subsequent ED visit within 3 days.

Methods: This was a multi-center retrospective longitudinal cohort study of hospital ED visits using non-public data from 325 licensed non-military acute care hospitals in California. Visits without a valid patient identifier and patients who expired were excluded. All patients between 1 through 17 were included and categorized as 1-4, 5-12, and 13-17 years of age. Visits without a valid patient identifier or who expired were excluded. Asthma and asthma-mimicking conditions were identified using ICD 9 Codes 466.1x (bronchiolitis), 493x (asthma, including active airway disease) and 786.7 (wheezing). Descriptive statistics are reported.

Results: A total 12,717,896 ED visits were included in the study period, of which 27,899 pediatric patients met inclusion and exclusion criteria resulting in 33,504 index ED visits. Overall, 1,540 (5.5%) of patients had at least one 3-day ED revisit for a total of 1,664 total visits. A total of 264 (15.9%) of these visits were a different facility than the index visit. Specific revisit rates were similar across each age group (1-4 years 6.3%; 5-12 and 13-17 years were both 5.1%). Patients 1-4 years of age had the highest admission rate (19.6%) followed by those 13-17 (16.8%) and 5-12 (15.4%).

Conclusion: ED returns within 3 days of an ED discharge for asthma or asthma-mimicking conditions are common in children. Understanding patterns in repeat visits may reveal opportunities to develop age appropriate interventions.

269 Telemedicine Provides Non-Inferior Research Informed Consent for Remote Enrollment: An Emergency Department-Based Randomized Control Trial

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Background: Telemedicine can pair emergency physicians in tertiary medical centers with rural emergency departments (EDs). Telemedicine networks are beginning to provide an avenue for rural health research, but using telemedicine to recruit participants for clinical trials is unproven.

Objectives: The goal of this study is to determine whether patient comprehension of telemedicine-enabled research informed consent is non-inferior to standard face-to-face research informed consent.

Methods: A prospective, open-label randomized control trial was performed in a 60,000-visit Midwestern academic ED. This study was conducted as part of a low-risk interventional clinical trial. Prior to being recruited into the study, potential participants were randomized in a 1:1 allocation ratio to consent by telemedicine vs. standard face-to-face consent. Telemedicine was provided using a commercially available interface (REACH platform, Vidyo Inc., Hackensack, NJ) to an emergency physician located in another part of the ED. Comprehension of research consent (primary outcome) was measured using a modified Quality of Informed Consent (QuIC) instrument, a validated tool for measuring research informed consent comprehension. Sample size was estimated to require 100 completed surveys using a non-inferiority design with a 5 point non-inferiority margin ($\alpha = 0.05$, power = 80%). Consent rate was a secondary outcome. Statistical comparisons were conducted with t-test, Mann-Whitney U test, and chi-squared test; statistical significance was defined by $\alpha < 0.05$ using two-tailed tests.

Results: One-hundred thirty-one patients were randomized (n = 67, telemedicine), and 101 QuIC surveys were completed. Comprehension of research informed consent using telemedicine was not inferior to face-to-face consent (QuIC scores 74.4 ± 8.1 vs. 74.4 ± 6.9 on a 100-point scale, p = 0.999). Subjective understanding of consent (p=0.194) and consent rates (56% vs. 69%, p = 0.142) were similar.

Conclusion: Telemedicine is non-inferior to face-to-face consent for delivering research informed consent, with similar comprehension and patient-reported understanding. This study will inform design of future telemedicine-enabled clinical trials.

270 Factors Influencing Emergency Medicine Patients' Decision to Participate in Clinical Research: Do They Vary from Other Clinical Specialties?

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Background: Patients' decision whether to participate in clinical research is influenced by multiple factors. It is unknown if certain factors influence patients differently among various specialties.

Objectives: To investigate factors affecting Emergency Medicine (EM) patients' research participation and whether they differ from other selected specialties.

Methods: An IRB-approved, anonymous, voluntary, 44-question self-administered survey was distributed in EM, Family Medicine (FM), Obstetrics/Gynecology (OB/GYN) and Infectious Disease (ID) waiting areas. Inclusion criteria were: >/=18 years of age, and physically and mentally competent to complete the survey. Two-tailed tests of statistical significance were computed for Spearman correlations.

Results: Analysis included 1841 subjects; 457 (24.8%) were EM, 451 (24.5%) FM, 408 (22.2%) ID and 525 (28.5%) OB/GYN patients. There were no significant differences in participant demographics across 4 specialties, except for OB/GYN where majority was female. Cumulative scores of the 10 motivating survey factors indicated ID patients were the most motivated to participate followed by OB-GYN (r_s=0.051, 0.035, respectively); EM and FM patients were least motivated (r_s= -0.027, -.060, respectively). Analysis of individual factors showed "knowledge learned from my participation will benefit someone in future" is most motivating to EM and ID patients (r_s=01.51, 0.263, respectively); OB/GYN and FM patients were most motivated by the doctor's reputation in the community (r_s=0.134, 0.004, respectively). Cumulative scores of the survey's 10 barriers indicated OB/GYN patients were most deterred, followed by EM (r_s=0.206, 0.008, respectively); FM and ID patients were least likely to be deterred (r_s= -.066, -.164, respectively). Analysis of single barriers showed "risk to future fertility" are most influential for EM and OB/GYN patients (r_s=0.137, 0.324, respectively); for FM patients, "time commitment" (r_s= 0.049) was most influential. ID patients did not find any of the given barriers to be a significant deterrent.

Conclusion: Factors influencing participation in clinical research can vary based on specialty of care. For EM patients, explaining how a study benefits others in the future might improve enrollment.

271 Exclusion of Non-English Speakers in Emergency Medicine Research: A Comparison of 2004 and 2014

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Background: Non-English speakers (NES) as a proportion of the United States population have steadily increased in recent years. There remains substantial risk of excluding NES from research. This extends to emergency medicine (EM) research specifically considering the safety-net designation of US emergency departments.

Objectives: To review all published studies in two leading EM journals for 2004 and 2014 and assess whether the percentage of studies that excluded NES has changed with time. We hypothesized that the frequency of exclusion would increase in 2014 compared with a decade earlier.

Methods: We retrospectively analyzed all original research articles in AEM and Annals for 2004 and prospectively for 2014. When given, we recorded purpose of study, geographic area, hospital census, hospital practice type, and inclusion or exclusion of NES. We excluded internationally based research, systematic reviews, meta-analyses, and research not involving patients. Demographic data were analyzed using descriptive statistics. Linear regression models, Chi-square and t-tests further tested our hypothesis; alpha set at 0.05.

Results: We included a total of 236 original research articles, 134 from AEM and 102 from Annals. Overall, 11% excluded NES from research (10% AEM vs. 12% Annals; p=0.75). Comparing all articles in 2004 vs. 2014, research excluded NES 6% vs. 16% of the time respectively (P=0.02). This was not statistically significant when comparing year to year for AEM (7.3% vs. 14.5%; P=0.12) and Annals (6.7% vs. 19%; P=0.06) separately. Factors affecting NES exclusion included type of study design (P<0.001), geographic area (P=0.009) and hospital type (P=0.035). Interestingly, 42% of articles failed to mention language as an exclusion or inclusion criteria.

Conclusion: There is a paucity of data regarding exclusion of NES from research in general and EM specifically. We found that a sizeable and worsening percentage of articles excluded NES from EM research. Furthermore, there exists a lack of reporting whether NES are excluded/included in the first place. There is real risk that EM research misses important clinical research conclusions by failing to include an already sizeable and growing segment of the population, one that is vulnerable in its basic ability to communicate illness.

272 Can You Trust Administrative Data? Accuracy of ICD-10 Diagnostic Codes to Study Pulmonary Embolism

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Background: Administrative data is a useful tool for research and quality improvement activities. However, the validity of research findings depends on the reliability of administrative data. Diagnoses are recorded using diagnostic codes, as defined by the International Statistical Classification of Diseases and Related Health Problems, 10th

Revision (ICD-10). Several groups have identified coding errors associated with ICD-10 assignments to patient diagnosis; these errors have implications for research, quality improvement and policymaking.

Objectives: As part of a quality improvement project evaluating diagnostic processes for pulmonary embolism (PE), we sought to validate the accuracy of ICD-10 coding for the ED diagnosis of PE.

Methods: Hospital administrative data from four urban EDs from July 2013 to January 2015 was obtained for adult (≥ age of 18) patients with an ICD-10 diagnostic code for PE. Medical records and imaging reports were used to confirm the diagnosis of PE. In the case of discrepancy between ICD-10 coding and chart review, chart review was considered the correct diagnosis, and the ICD-10 code was considered incorrect. Coding discrepancies were quantified and described.

Results: 1,305 ED patients had an ICD-10 code for PE during our study period. 257 (19.7%) of these patients' diagnoses were incorrectly coded. 211 patients, whose diagnoses were, "rule-out PE" or "query PE", were assigned a PE code. 64 other patients were miscoded as having a PE and should have been assigned an alternate code, such as chest pain, hypoxia, pleural effusion, anxiety, or dyspnea. For 4 of the 64 miscoded patients, their physician did not fill out the discharge diagnosis box; however, the triage and physician assessment notes indicated no suspicion of PE.

Conclusion: Our work suggests the need for more accuracy in ICD-10 coding of ED diagnoses of PE. Caution should be exercised when using administrative data for studying PE, and validation of the accuracy of ICD-10 coding prior to research use is recommended.

273 Assessing the Quality of Primary Outcomes for Randomized Controlled Trials in Emergency Medicine

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Background: Randomized controlled trials (RCTs) play a critical role in the evaluation of medical interventions. Selecting a trial's primary outcome requires weighing multiple and often conflicting considerations, including cost, clinical relevance, and the likelihood of finding a statistically significant result. As a result, multiple primary outcomes, composite outcomes, and disease-oriented (rather than patient-oriented) outcomes are sometimes used, making the clinical application of trial results challenging. The frequency with which these techniques are used is unknown.

Objectives: We sought to determine the prevalence of multiple primary outcomes, composite outcomes, and disease- vs. patient-oriented outcomes among EM-based RCTs.

Methods: We searched the tables of contents of two EM journals (Academic Emergency Medicine and Annals of Emergency Medicine) and four major general medical journals (NEJM, JAMA, Lancet, BMJ) to identify RCTs which explicitly reported randomizing patients either in the pre-hospital setting or in the ED. Trials published from 7/1/2014 to 6/30/2015 were included. Two emergency physicians independently abstracted trial and outcome characteristics and determined the number of primary outcomes, the use of disease- or patient-oriented outcomes, the presence of composite outcomes, and the relative importance of the components of each composite outcome. A third emergency physician adjudicated discrepancies.

Results: 42 RCTs met inclusion criteria, including 17 published in EM journals and 25 in general medical journals. The median trial size was 352 participants (IQR 208-746). Seven trials (17%) had multiple primary outcomes, of which two reported adjusting for multiple comparisons. Seven trials (17%) had composite primary outcomes, and for three of these the outcome components were of unequal clinical importance. 12 trials (29%) reported disease-oriented primary outcomes. 24 trials (57%) reported a single non-composite patient-oriented primary outcome.

Conclusion: Multiple primary outcomes, composite outcomes, and disease-oriented outcomes are each present in a small, but not insignificant fraction of RCTs in emergency medicine. Investigators, peer-reviewers, and clinicians should be aware of how these entities can affect the clinical applicability of trial results.

274 Computerized Adaptive Depression Screening and Diagnosis in the Emergency Department

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Background: Major depressive disorder (MDD) affects as many as 1/3 of emergency department (ED) patients; however, to date, little is known about the severity of MDD in ED patients. Also, screening for MDD in ED patients is challenging because gold standard diagnostic tools require time and intensive resources and brief MDD screening tools have poor precision.

Objectives: We aimed to 1) measure MDD prevalence and severity in an ED population, 2) assess the feasibility of deploying a validated computerized adaptive test (CAT) for screening and diagnosing MDD, and 3) measure provider MDD assessment accuracy.

Methods: During a nine-month period, a random sample of adult ED patients presenting for non-mental health indications were administered the Computerized Adaptive Diagnostic-MDD (CAD-MDD) and the Computerized Adaptive Testing-Depression Inventory (CAT-DI) at an academic, urban hospital. The CAD-MDD was used to screen for MDD and the CAT-DI provided the severity of MDD (no depression; mild, moderately severe, or severe depression). Provider assessments were collected via a 1-question survey and compared to the CAD-MDD as the criterion standard.

Results: We enrolled 1000 of 1537 eligible patients (65%). MDD was diagnosed in 26% while only 4% and 3%, respectively, were classified as either moderately severe or severely depressed. Median test administration time for CAD-MDD was 57 seconds (IQR, 42-80 seconds) and for CAT-DI was 93 seconds (IQR, 67-127 seconds). The sensitivity of provider assessment for depression diagnosis was 28% (69/243; 95% CI, 23%-32%), with a specificity of 86% (579/675; 95% CI, 83%-88%).

Conclusion: MDD prevalence in the ED population is quite high. A much smaller fraction may have severe depression, requiring immediate access to psychiatric services. Given the low sensitivity of provider assessments, CAT tools could play an important role in efficiently diagnosing patients and triaging patients to appropriate psychiatric resources.

275 Effect of Prior Concussion on Sonographic Optic Nerve Sheath Diameter Measurement After Undergoing Transient Intracranial Pressure Change

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Background: The measurement of the optic nerve sheath diameter (ONSD) by ultrasound is widely recognized as a correlate of intracranial pressure (ICP). Measurement of the ONSD by ultrasound is a quick, non-invasive, and readily available point of care tool that can indicate the need for further evaluation of elevated ICP when ONSD dilation is noted in a patient. With the increased clinical prevalence of utilizing sonographic ONSD measurements, it is important to recognize additional causes of ONSD dilation.

Objectives: The purpose of this study was to determine the effect of prior concussion on sonographic ONSD measurements after undergoing transient ICP change via Valsalva maneuver.

Methods: The ONSDs of 10 participants without prior traumatic brain injury (TBI) and 10 participants with a history of mild TBI (concussion) that occurred 1-14 years earlier were measured via ultrasound. The ONSD of each participant was then measured immediately after performing the Valsalva maneuver for 30-45 seconds.

The pre- and post-Valsalva ONSD measurements of each group were then compared using a two-tailed paired t-test.

Results: The group without prior TBI showed no significant ONSD dilation with an average increase of 0.03 mm (95%CI -0.034 to 0.09, p=0.3446). The group with prior concussion showed significant ONSD dilation with an average increase of 1.31 mm (95%CI 0.89-1.74, p=0.0001).

Conclusion: These results indicate that transient increases of ICP can interfere with ONSD measurements when individuals have experienced prior concussions. The ability of the ONSD to remain dilated with physiological processes such as Valsalva suggests that dilation may not be representative of increases in ICP secondary to acute injury in individuals with prior history of concussion. Additionally, detection of abnormal dilation of the ONSD after Valsalva maneuver may serve as a screen for or evidence of prior concussion.

276 Variable Interpretation of Cardiac Standstill Among Physician Sonographers

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Background: Point of care Echocardiography has been widely studied as a marker of prognosis in cardiac arrest (Blaivas 2001, Tayal 2003, Salen 2005). Studies have shown widely varying results from 45% survivors of cardiac standstill to none (Tomruk 2012, Blyth 2012). Importantly, the very definition of standstill varies in these studies from a slight change in echogenicity of the myocardium to any kinetic cardiac activity. We hypothesized that the variability in research definitions of standstill would be reflected in those of individual sonographers.

Objectives: The goal of this study was to assess the variability in determination of cardiac standstill on bedside echocardiography among physician sonographers from different specialties and with various ultrasonography experience.

Methods: We surveyed physician sonographers at five conferences held at three academic medical centers with ultrasound divisions in the New York city area. The subjects were allotted twenty seconds per video clip to determine whether each of fifteen clips of patients in cardiac arrest were standstill or not. Data were collected anonymously using Turning Technologies' Turning Point© polling software and exported to R for analysis.

Results: There were ninety-eight total participants including faculty, fellows, and resident physicians specializing in Emergency Medicine, Critical Care and Cardiology. There was only moderate inter-rater agreement amongst all participants (Krippendorff's Alpha coefficient = 0.47). This lack of agreement persisted across specialties, training levels, and self reported ultrasound expertise (Table 1).

Conclusion: There is substantial variability in determination of cardiac standstill among physician sonographers of varied specialities, levels of training, and ultrasonography experience. A clear definition of cardiac standstill is necessary to improve the quality of cardiac arrest ultrasound research and to standardize the use of this technology at the bedside.

Cardiac Standstill Inter-rater Agreement

	Krippendorff's Alpha	Agreement
Specialty: Emergency Medicine	0.50	Moderate
Specialty: Critical Care	0.40	Fair
Specialty: Cardiology	0.47	Moderate
Training Level: Attending	0.46	Moderate
Training Level: Fellow	0.55	Moderate
Training Level: Resident	0.43	Moderate
US Experience: Basic	0.43	Moderate
US Experience: Intermediate	0.53	Moderate
US Experience: Expert	0.41	Moderate

Table 276: Hu.

277 Operating Characteristics of Point-of-Care Ultrasound in Identifying Skin and Soft Tissue Abscesses in the Emergency Department

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Background: Traditionally, ED physicians rely on their clinical examination to differentiate between cellulitis and abscess when evaluating skin and soft tissue infections (SSTI). Management of an abscess requires incision and drainage (I and D), whereas cellulitis requires a course of antibiotics. Misdiagnosis results in unnecessary I and D procedures, sedations (in pediatric I and D), or a return ED visit for failed antibiotic therapy.

Objectives: To measure the operating characteristics of point-of-care ultrasound (POCUS) compared to clinical examination in identifying abscesses in ED patients with SSTI.

Methods: We systematically searched the Medline, Web of Science, EMBASE, CINAHL and Cochrane Library databases from inception till July 2015. Trials comparing POCUS with clinical examination to identify abscesses when evaluating SSTI in the ED were included. Trials that included intraoral abscesses or abscess drainage in the operating room were excluded. Presence of an abscess was determined by pus drainage. Absence of an abscess was determined by no pus drainage on I and D, or resolution of SSTI without pus drainage at follow up. Quality of trials was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria. Operating characteristics are reported as sensitivity, specificity, positive likelihood (LR+) and negative likelihood (LR-) ratios with their respective 95% CIs. Summary measures were calculated by generating a hierarchical summary receiver operating characteristic model (HSROC).

Results: Of 3203 references identified, 5 observational studies (3 pediatric trials and 2 adult trials) with a total of 615 patients were included. We rated the quality of 3 trials as low and 2 as very low. The

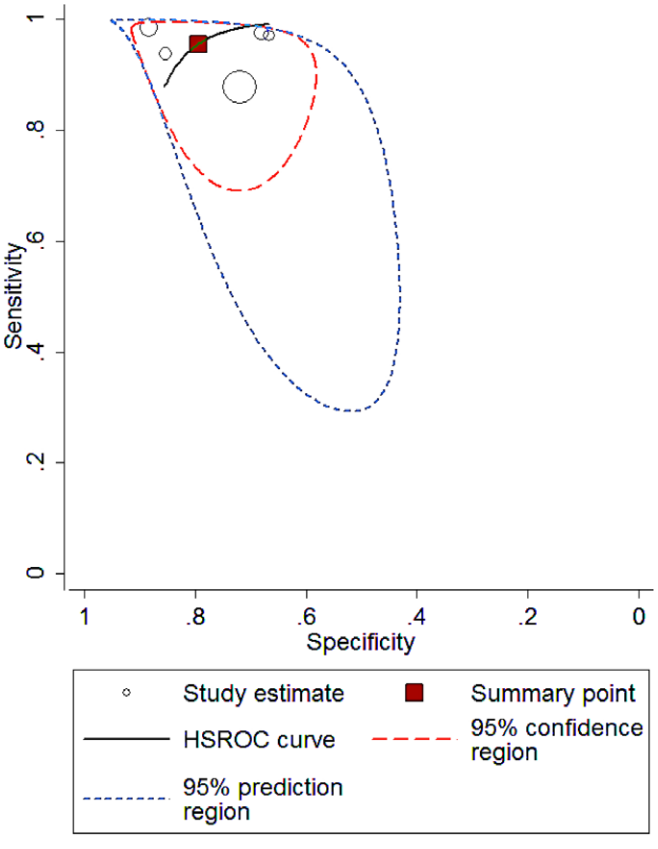

Figure 277 – Subramaniam

Table 1. Sensitivity [Sn], Specificity [Sp], LR+ and LR- of clinical exam (CE) compared to POCUS

Marin et al. 2013	CE	Sn: 87% (81-91%)	Sp: 71% (62-79%)	LR+: 3.0 (2.3-4.1)	LR-: 0.2 (0.1-0.3)
	CE + POCUS	Sn: 88% (82-92%)	Sp: 72% (63-79%)	LR+: 3.1 (2.4-4.1)	LR-: 0.2 (0.1-0.2)
Berger et al. 2012	CE	Sn: 76% (58-89%)	Sp: 83% (36-99%)	LR+: 4.6 (0.8-28)	LR-: 0.3 (0.1-0.6)
	POCUS	Sn: 97% (83-100%)	Sp: 67% (24-94%)	LR+: 2.9 (0.9-9.0)	LR-: 0.04 (0.005-0.4)
Iverson et al. 2012	CE	Sn: 90% (75-97%)	Sp: 72% (50-87%)	LR+: 3.2 (1.7-6.1)	LR-: 0.1 (0.05-0.4)
	POCUS	Sn: 98% (85-100%)	Sp: 68% (46-84%)	LR+: 3.0 (1.7-5.4)	LR-: 0.04 (0.005-0.3)
Sivitz et al. 2010	CE	Sn: 78% (52-93%)	Sp: 81% (63-92%)	LR+: 4.1 (1.9-8.9)	LR-: 0.3 (0.1-0.7)
	POCUS	Sn: 94% (68-100%)	Sp: 85% (68-94%)	LR+: 6.4 (2.8-14)	LR-: 0.07 (0.01-0.5)
Squire et al. 2005	CE	Sn: 86% (74-93%)	Sp: 70% (54-82%)	LR+: 2.8 (1.8-4.5)	LR-: 0.2 (0.1-0.4)
	CE + POCUS	Sn: 98% (90-100%)	Sp: 88% (74-96%)	LR+: 8.5 (3.7-19)	LR-: 0.02 (0.003-0.1)

The POCUS HSROC (Figure 1 below) revealed a sensitivity of 96% (95%CI 89-98%), specificity of 79% (95%CI 71-86%), LR+ of 4.6 (95%CI 3.2-6.8), and LR- of 0.06 (95%CI 0.02-0.2)

operating characteristics of POCUS and clinical examination for these 5 trials are presented in table 1. Two trials compared clinical exam to clinical exam plus POCUS. The other 3 directly compared clinical exam to POCUS.

Conclusion: Existing evidence indicates that POCUS is useful in identifying abscesses in ED patients presenting with SSTI.

278 Retrospective Review of Ectopic Pregnancies Diagnosed by Emergency Department Point-of-Care Ultrasound (POCUS)

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Background: Ectopic pregnancy is a high-risk condition that occurs in only 1.9% of reported pregnancies. However, as high as 20% of pregnant patients presenting to the emergency department with abdominal pain will have ectopic pregnancy (1). Both clinician performed point of care ultrasound (POCUS) performed by emergency physicians or consultative ultrasound by the radiology department (RADUS) has been used in the diagnosis of ectopic pregnancy.

Objectives: To assess whether POCUS reduces time to ED disposition (ED LOS), time to operating room (OR), and hospital length of stay (LOS) in ectopic pregnancies.

Methods: A retrospective chart review was performed on patients presenting to the ED from January 1, 2014 to August 1, 2015 who were diagnosed with ectopic pregnancy. Patient charts that utilized RADUS were compared to patient charts that used POCUS. The time to disposition, OR, and hospital LOS were reviewed.

Results: From 2014-2015 there were 133 patients diagnosed with ectopic pregnancy. 41% of patients received POCUS, 68% received RADUS, and 12 patients (9%) received both. 92% were admitted and 63 (47%) went to OR. Of the OR patients, 29 had POCUS alone and 5 (8%) had both POCUS and RADUS. On average, ED LOS for POCUS was 300 minutes vs 360 minutes for RADUS (p=0.11); Time to OR for POCUS was 519 minutes vs 545 minutes for RADUS (p=0.78). Hospital LOS was 1.02 days for patients that received POCUS vs 1.13 days for patients that had RADUS (p=0.53). During RADUS hours of operation, 32% had POCUS compared to 74% RADUS. When RADUS was unavailable, 100% had POCUS, but 31% also had RADUS conducted by an on-call technician. Time to OR was 431 minutes when RADUS was unavailable and diagnoses was made by POCUS alone vs 543 minutes in other cases (p=0.48).

Conclusion: POCUS is often used in suspected ectopic pregnancies. Temporal outcomes for diagnosed ectopic pregnancies with POCUS are not inferior to that of RADUS. POCUS may allow for faster decision making and earlier implementation of treatment in patients diagnosed with ectopic pregnancies.

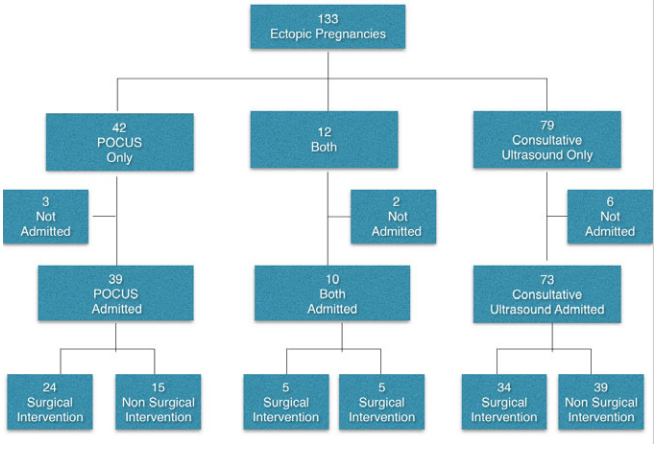

Figure 278 – King

279 Competency Assessment of Emergency Medicine Resident Point-of-Care Ultrasound Performance

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Background: Point-of-care ultrasound (US) is one of the ACGME milestone competencies for Emergency Medicine (EM) residency graduates. The current ACEP guidelines recommend that trainees perform 150-250 ultrasound scans during residency. We sought to determine whether this numerical threshold correlated with performance on an observed structured clinical exam (OSCE).

Objectives: To measure the relationship between the number of US scans performed and OSCE scores of senior emergency medicine residents.

Methods: Ultrasound fellowship trained EM physicians designed an OSCE that consisted of standardized questions testing image acquisition and interpretation as well as image optimization, patient positioning and troubleshooting. Residents were observed while performing core applications including aorta, biliary, cardiac, DVT, FAST, pelvic, and thoracic imaging. The total number of US examinations residents had performed since starting residency was obtained from a database and compared to the total OSCE scores.

Results: Twenty-nine PGY-3 and PGY-4 emergency medicine residents participated in the OSCE. Out of a maximum score of 370, the median OSCE score was 354 [Interquartile range (IQR) 346, 361]. Higher scan numbers were associated with better OSCE performance, p= 0.03 (see Figure 1). Using the ACEP guideline recommendation of >250 total scans, we grouped trainees into those who exceeded that goal compared to those that did not. Residents with more than 250 US

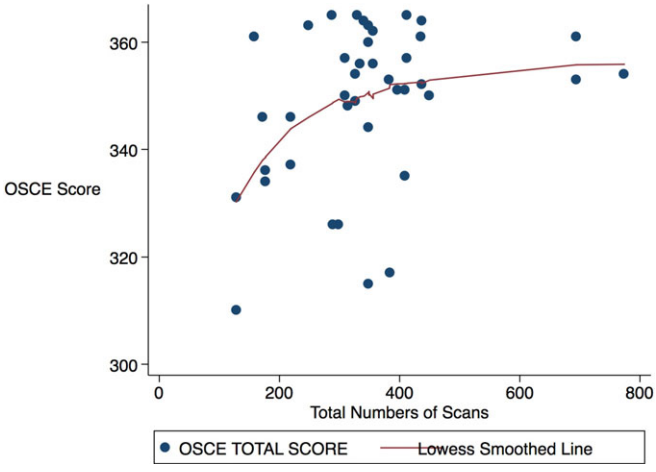

Figure 279 – Koskenoja

scans had a median OSCE score of 354 [IQR 349, 361] compared with a median score of 337 [IQR 334, 346] in the group with less than 250 total scans (p=0.048).

Conclusion: In a group of EM residents, a greater number of US examinations performed in residency was associated with higher scores on an OSCE. Based on the observed performance plateau, a threshold of 250-350 appears to be an appropriate target for the total number of ultrasounds performed during EM residency training.

280 Low-Cost Non-Commercial Ultrasound Gels for Use in Resource Limited Settings

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Background: Ultrasound is increasingly available in resource-limited settings where commercial ultrasound gel is expensive and often unavailable.

Objectives: This study evaluated low-cost ultrasound gel recipes to explore alternatives to commercial gel.

Methods: A search for ultrasound gel recipes on the Internet and in the literature revealed five recipes. Half-strength commercial gel and modified glucomannan recipes were also tested (Table 1). The gels were evaluated in Liberia and the USA. In each of the 2 sessions, 2 sonologists evaluated 2 models to render 8 evaluations per gel. Sonologists and models, blinded to gel identity, made independent quantitative (1-5 Likert scales) and qualitative evaluations of smell, ease of sliding, liquidity, ease of cleansing, and image quality. Two of the sonologists were radiologists and 2 were emergency physicians experienced in ultrasound. Each gel was assessed using 3 types of application/probe (cardiac parasternal long axis/phased array, vascular structures of forearm/linear array, and hepatorenal recess /curved array). A 2-way analysis of variance was performed to test for differences by gel type and by country for quality (range: 3-15) and total score (range: 9-45). Post-hoc pairwise comparisons to commercial gel type (gel I) were performed using Dunnett's t-test.

Results: Gels E, F, G did not differ significantly from commercial gel for image quality (14.4, 14.4, 13.9 vs 15 respectively) or for overall score when tested in the USA or in Liberia (42.9, 43.1.42.3, vs 45). Gel D's overall scores did not differ significantly from commercial gel (45) in the

Table 1: Quantitative and Qualitative Evaluation of Low-Cost Gel by Score

Gel	Recipe	Subject Comfort	Ease of cleansing skin	Smell	Lubrication	Ease of cleansing transducer	Consistency	Quality total	Score total
I	Commercial Gel	5.0/ Good	5.0/ Good	5.0	5.0/ Good	5.0/ Good	5	15.0/ Good	45.0/ Good
F	Xanthine Gum (2 tsp) + Boiling Water (2 cups)	4.9/ Good	4.9/ Good	5.0	4.8/ Good	5	4.3/ Thin, runny	14.4/ Good	43.1/ Good
E	Commercial Gel (1 part) + Cold Water (1 part)	4.9/ Good	4.8/ Good	4.9	4.7/ Good	4.8/ Easy, sticky	4.4	14.4/ Good	42.9/ Good
G	Glucomannan (1 tsp) + Boiling water (2 cups)	4.8/ Good	4.3/ Good	5.0	4.9/ Good	5.0/ Somewhat sticky	4.5	13.9/ Slightly impaired resolution	42.3/ Good
D	Guar Gum (2 tsp) + Vegetable Glycerin(0.5 tsp) + Boiling Water (2 cups)	4.8/ Too runny, poor	4.5/ Slightly sticky	5.0	4.6/ Poor sliding	4.8/ Difficult	4.4	13.9/ Good	41.9/ Acceptable
A	Guar gum (2 tsp) + Salt (1 tsp) + Boiling Water (2 cups)	4.9/ Gritty	4.6/ Sticky	5.0	4.8/ Thin, needs re-application	4.8/ Slimy	3.6	13.0/ Poor resolution, artifacts present	40.6/ Good with some limitations
B	Cornstarch (1 part) + Boiling Water (10 parts)	4/ Dried quickly, poor sliding	4.6/ Sticky	4.9	4.0/ Dries fast, sticky	4.9/ Sticky	4.0/ Too liquid	13.3/ Impaired resolution	39.4/ Liquid consistency problematic
H	Glucomannan (3 tsp) + Boiling water (2 cups)	3.9/ Sticky	3.9/ Difficult, left residue	4.8	3.4/ Difficult, left residue	4.3/ Sticky	3.4/ Too thick	12.0/ Grainy with impaired resolution	35.5/ Poor
C	Glucomannan (3 tsp) + Cold Water (500 mL)	3.9/ Sticky, thick	3.6/ Difficult, left residue	4.8	3.1/ Sticky	3.8/ Difficult, Sticky	3.4/ Viscid, Pasty	12.3/ Good	34.8/ Good resolution, consistency problematic

Table 280: Vinograd.

USA (43.8) but did in Liberia (40). While there was a detectable difference between Gels C (34.8) and H (35.5) and commercial gel in both countries, they scored well overall in Liberia (39.8, 40.3) but poorly in the USA (29.8, 30.8). The qualitative comments were most favorable for gels E, F, and G (Table 1).

Conclusion: Xanthine gum, low concentration glucomannan mixed with boiling water, and half-strength commercial gel were not statistically different from commercial gel in this study. Results varied by country and suggest that minor variations in gel preparation or factors related to water quality and/or weather may influence the gels' quality. Further study may reveal refinements of recipes and differences in shelf-life among the gels.

281 The Triage of Intoxicated Men by Non-Medical Personnel

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Background: Patients with chronic alcohol intoxication pose significant resource and financial challenges to hospitals, emergency medical systems (EMS), police departments and cities. An effective way to decrease healthcare overuse by this frequently homeless population is to triage patients to an alternative facility (sobering center). Intrinsic in this triage decision is the assessment of the level of intoxication and concomitant medical or traumatic illness- occult or otherwise. Prior work evaluating the performance of complicated triage checklists including vital signs, breath alcohol readings, and point of care glucose readings used by medically-trained personnel (EMS) has found this approach sensitive but poorly specific.

Objectives: To determine the ability of non-medical staff without a checklist, vital signs, glucose or breath alcohol results to determine the need for medical care of homeless, suspected intoxicated patients.

Methods: At a men's homeless shelter that accepts intoxicated clients, staff performed routine check-in on self-presenting clients in the evening. If staff suspected the client was intoxicated, they were asked to determine if the client needed medical attention or was safe for the shelter. Staff members were blinded to breath alcohol readings. Thirty minutes after this initial assessment, a secondary assessment was made by a consensus of the staff. Final client outcomes in the morning were recorded. Sensitivity and specificity were calculated, and Spearman Correlation was assessed between staff's perception of client intoxication and breath alcohol reading.

Results: 151 staff-client interactions (SCIs) were observed, data was complete on 145. Staff identified 3 clients as needing ED care on initial assessment; one was ultimately deemed safe for the shelter on secondary assessment. Of the 143 SCIs deemed safe for the shelter, there were no adverse events or subsequent need for medical intervention. Sensitivity was 100% and specificity was 99.3%. Spearman correlation between staff's perceived level of client intoxication and breath alcohol concentration (BAC) was rho=0.5181.

Figure: Results of Initial and Final Assessments

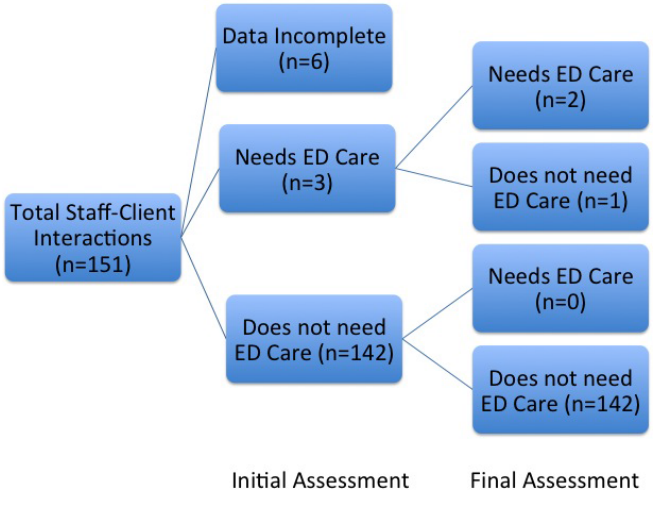

Figure 281 – Warren

Conclusion: Homeless shelter staff members who have no formal medical training may be able to safely triage homeless, intoxicated patients without using a checklist. Staff had a moderate ability to assess a client's level of intoxication.

282 Emergency Prescribers and Rescue Naloxone: Results of a Health-System Survey

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Background: Opiate addiction is a national epidemic and emergency physicians are on the front lines of this public health crisis. Rescue naloxone (NAL) is becoming increasingly available in communities, yet little is known about the barriers to prescribing NAL faced by emergency clinicians nor their beliefs or willingness to prescribe rescue NAL.

Objectives: This study sought to 1) examine clinician beliefs and 2) identify facilitators and barriers regarding the prescription of rescue NAL in the emergency setting.

Methods: We conducted a statewide survey of emergency clinicians, including: 1) prior NAL prescribing experience, 2) likelihood of prescribing in various scenarios, 3) prescribing facilitators and barriers, and 4) comfort with various prescribing methods.

Results: 125 of 300 invited prescribers (44%) responded. The majority (99%) have never prescribed rescue NAL and only 1 respondent was asked by a patient/family to provide NAL. Most felt comfortable providing either a NAL prescription or a rescue kit (61%), while fewer were more comfortable with a kit (14%) or prescription (8%) alone. Barriers perceived as 'very' or 'extremely' important included 1) lack of education on NAL for patients (63%) and providers (51%), 2) the ability of patients to fill prescriptions (51%), 3) cost (32%), and 4) access to refills (29%). Considerations noted to be 'very' or 'extremely' important to facilitate prescribing were 1) education for patients/families (73%) and clinicians (48%), 2) having kits locally available (57%), 3) low cost (48%), and 4) the presence of a responsible support person (44%). ED clinicians were most likely to prescribe NAL for patients who had been resuscitated after an overdose (44%), when requested by a patient/family (36%), and for those with addictions seeking treatment (28%).

Conclusion: In this cohort of emergency prescribers, most indicated a willingness to prescribe rescue NAL for patients/families at high-risk for experiencing an overdose. Lack of education for patients and providers was perceived as an important prescribing barrier. Significant cost, availability of NAL locally, and lack of access to refills were important considerations. The barriers to NAL prescribing identified here represent a mix of easily modifiable and more significant challenges that have important health policy implications.

283 Emergency Medicine and Active Labor Act 2002-15: Review of Office of Inspector General Patient Dumping Settlements

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Background: The Emergency Medicine and Active Labor Act (EMTALA) of 1986 prevents hospitals from "dumping" or refusing

patients for financial reasons and is enforced by the Office of the Inspector General (OIG).

Objectives: To determine the scope, cost and most common allegations leading to monetary settlement against hospitals and physicians.

Methods: Review of OIG investigation archives on May 2015, including cases settled from 2002-15 (https://oig.hhs.gov/fraud/enforcement/cmp/patient_dumping.asp).

Results: There were 192 settlements (14/year for 4000+ hospitals in the USA). Fines against hospitals and physicians totaled $6,357,000 (means $33,435 and $25,625 respectively). 184 (95.8%, $6,152,000) were against hospitals and eight against physicians ($205,000). Most common reasons were failing to screen 144/192 (75%) and stabilize 82/192 (42.7%) for emergency medical conditions (EMC). There were 22 (11.5%) inappropriate transfers and 22 (11.5%) more failure to transfer. Hospitals failed to accept appropriate transfer in 25 (13.0%) cases. Patients were turned away from hospitals for financial status in 30 (15.6%) cases. There were 13 (6.8%) violations for patients in active labor. In 12 (6.3%) cases, the on-call physician refused to see the patient and in 28 (14.6%) cases, the patient was inappropriately discharged. There were approximately 1200 OIG EMTALA investigations from 2002-15. Therefore, 16% (192/1200) resulted in fines.

Conclusion: Of hospitals and physicians settling with the OIG, most were for failing to provide screening and stabilization to patients with EMCs. The reason for patient "dumping" was due to financial status in 15.6% of settlements. 16% of investigations resulted in fines.

284 Patterns in EMTALA Enforcement for Psychiatric Emergencies: Temporal and Regional Variation Between 2005 and 2014

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Background: The Emergency Medical Treatment and Active Labor Act (EMTALA) is an anti-dumping statute requiring that any patient presenting to an emergency department (ED) have a timely medical screening evaluation, stabilization of identified emergent conditions, and, when indicated, transfer for higher level of care. In 2003, the Center for Medicare and Medicaid Services (CMS) clarified that EMTALA applied specifically to patients with emergent psychiatric conditions and patients presenting to dedicated emergency psychiatric evaluation areas.

Objectives: To describe trends in EMTALA enforcement for psychiatric emergencies over the past decade.

Methods: We obtained a comprehensive list of all citations for EMTALA violations between 2005 and 2014 directly from CMS. Data provided included date and location of cited facility, as well as the service that was alleged to be deficient (e g psychiatric, medical, labor, obstetrical, trauma or other surgical). Temporal trends and regional variation in EMTALA enforcement by CMS were described.

Results: Between 2005 and 2014, CMS issued 2118 citations for EMTALA violation of which 355 (17%) were related to psychiatric emergencies. Overall, there has been a general decline in the number of citations related to psychiatric emergencies from 45 in 2005 to 32 in 2014 (29% decrease), a decline that is approximately proportional to the decline EMTALA citations overall (35%). Substantial regional variation in citations was noted between CMS regions. Nationally, there were 11.4 violations per 10 million population over the study period but this ranged from 2.5 per 10 million in CMS region II (New York office) to 34.5 in CMS region VII (Midwest- Kansas City office) (14-fold variation). Four hospitals had CMS provider agreements terminated following EMTALA citation, all four of these terminations ultimately resulted in facility closure.

Conclusion: We report the first national estimates of EMTALA enforcement activities for psychiatric emergencies and note a gradual decline in citations for EMTALA violations over time and substantial variation in enforcement across CMS regions. Future research should focus on whether this downward trend reflects improvement in psychiatric emergency care following clarification of the EMTALA law to include psychiatric emergencies or diminishing enforcement efforts by CMS.

285 Does EMTALA Improve Hospital Quality? The Effect of EMTALA Investigations and Citations on Hospital Core Measures

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Background: Passed in 1986, the Emergency Medical Treatment and Active Labor Act (EMTALA) was landmark legislation aimed at improving access to quality care. EMTALA violations may result in costly corrective action plans, fines, or termination of a hospital's CMS contract. In the past decade, nearly 50% of hospitals have been investigated and 25% cited for EMTALA violations. However, little is known about the effects of EMTALA on hospital quality.

Objectives: The goal of this investigation is to quantify changes in hospital quality, if any, in response to an EMTALA investigation.

Methods: We obtained a list of EMTALA investigations and citations completed by CMS between 2005 and 2014 and merged it with quarterly quality reports available publicly from CMS. Twenty-four core measures were available throughout the study period concerning 3 conditions: Acute myocardial infarction (AMI), congestive heart failure (CHF) and pneumonia (PNA). Performance on each measure was normalized by quarter across hospitals. Normalization set the mean score to zero (negative scores indicate lower quality). Condition-specific quality scores were created by averaging individual measure scores for that condition (e.g. AMI). An overall quality measure was created by averaging the 3 condition-specific scores. We then examined changes in hospital quality in the year before and after an investigation/citation. Paired Student's t-test was used to determine statistical significance.

Results: There were 4138 investigations and 1841 citations among the 5994 hospitals that reported quality measures during the study period. Quality significantly improved following an EMTALA *investigation*. Overall quality improved from a baseline normalized score of -0.04 to -0.02 (difference 0.02 (95% CI 0.01-0.05), $p = 0.01$). Condition-specific quality improved similarly (PNA quality improved 0.03, $p<0.01$, AMI quality improved 0.05, $p=0.01$, CHF improved 0.02, $p=0.04$). Interestingly, improvements in quality following an EMTALA *citation* were similar in magnitude to improvements following an investigation but were not statistically significant (possibly due to lower power).

Conclusion: Over the past 10 years, EMTALA investigations have resulted in significant improvement in hospital quality. Research examining the specific effect of EMTALA investigation and citations on emergency care should follow.

286 What Drives Prep Interest in At-Risk Urban Emergency Department Patients?

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Background: U.S. Public Health Service recommends clinicians consider offering preexposure prophylaxis (PrEP) to patients at risk of acquiring HIV. In ED settings, little is known about at-risk individual's

interest in PrEP and if interest varies by race/ethnicity or risk behaviors.

Objectives: To determine how interest in PrEP varies among at-risk groups and how risky behaviors might change if given PrEP.

Methods: We anonymously surveyed a convenience sample of ED patients who tested HIV negative in an ED-based HIV screening program. The prevalence of undiagnosed HIV in this ED is 0.5%. The data was used to assess interest in PrEP and determine risk for acquiring HIV infection.

Results: Overall, 675 patients completed the questionnaire and 41% were interested in taking PrEP. Demographics of the sample were 55.7% male, 43.3% female, and 0.9% male to female transgender; 46.4% of patients were married or in a committed relationship; 73.5% Latino, 14.4% Black, 7.6% White, 3.4% Asian and 62.7% of patients spoke Spanish primarily. Using U.S. Public Health Service criteria, 52.3% of men who have sex with men (MSM), 22.3% of heterosexual men and women, and 43.3% of intravenous drug users (IDU) were at-risk of acquiring HIV infection. Among at-risk patients, interest in PrEP was high (70%) and varied between at-risk heterosexuals (67%), MSM (82%) and IDU (77%) but not significantly by race/ethnicity. Reasons for interest in PrEP were similar across race/ethnic groups. 88-91% of at-risk individuals agreed with the statement "HIV scares me a lot" as a reason to take PrEP. Fewer agreed they were actually at high-risk for contracting HIV in the next year (29%). A substantial proportion of at-risk individuals reported that taking PrEP would increase their likelihood of having sex without a condom (50%) or sharing needles during drug use (12%).

Conclusion: Among patients at risk for contracting HIV in an urban ED, we observed fairly high interest in PrEP (70%), particularly among MSM and IDU (80%). Interestingly, half of individuals interested agreed they would be more likely to engage in risky sex/drug behaviors if taking the medication. Community messaging is needed to emphasize that PrEP should be used in addition to rather than as a replacement for barrier sex protection and/or clean needles.

287 EMS Providers' Willingness to Respond in a Tactical Environment

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Background: Active shooter scenarios are unfortunately becoming a more common occurrence in our society. Between 2000 and 2013 there were 160 incidents with over 1000 casualties. The majority of these incidents last less than 15 minutes. A medic not formally part of a tactical unit arriving on scene and entering the warm zone with police may be able to save lives that would otherwise be lost to delayed care. To allow this, these medics would need two things: the ability/training to respond and the willingness to do so.

Objectives: This survey is designed to measure the willingness of EMS providers to respond in a tactical environment.

Methods: We conducted this survey at the EM Today conference in Greensboro NC, Monday October 5th 2015. Those in attendance at the second general session were asked to complete a survey. The survey included 6 yes or no questions along with a demographic section. All statistics were calculated using a chi-square analysis.

Results: The overall response rate was 76%, 391 of 515 in attendance. The majority of surveys were completed by paramedics and males (64%). Most (61%) of respondents had 16 years or more of EMS experience with only 20% reporting previous military or law enforcement experience. Out of 391 respondents, 75% stated they would respond if only given ballistic gear. The majority (61%) stated they would not respond if they were not provided ballistic gear or a firearm. Those with tactical/military training are more likely to respond with no ballistic gear and no firearm than those without military training ($p<0.001$). Those with tactical/military training are more likely to respond with ballistic gear and firearm than those without military training ($p<0.001$). Current/former military members are more likely to respond with no ballistic gear and no firearm then those without military training ($p<0.001$). Ninety-one percent of respondents were not a part of a tactical medical response unit and only 35% reported yes to having tactical medical training.

Conclusion: The majority of surveyed EMS providers would be willing to act in a tactical environment if provided ballistic gear. By providing our EMS members with tactical training we can further increase the number of those willing to act. With these two actions we may be able to save lives in an active shooter situation that would otherwise be lost.

288 Factors Associated with the Need for Advanced Cardiac Care in Prehospital Chest Pain Patients

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Background: Rapid identification and transfer to an appropriate facility with advanced cardiac capabilities is recommended for patients with ST-segment elevation (STEMI) identified in the prehospital setting. Identifying prehospital patients who may benefit from advanced cardiac care without STEMI is currently challenging as no study has evaluated factors directly from EMS charts.

Objectives: The objective of this study was to determine which factors in the prehospital record were associated with the need for advanced cardiac care in patients without STEMI.

Methods: We performed a retrospective chart review of prehospital charts with a prehospital chief complaint of chest pain. Specific past medical history pertinent to the chief complaint were identified in the prehospital record. Our primary singular outcome was need for cardiac catheterization (CC) during admission. We also evaluated a composite outcome (CO) including any of the following during admission: death, maximum troponin>10 ng/ml, abnormal echocardiogram, and cardiac catheterization with and without percutaneous intervention (PCI). We performed a univariable Poisson regression for all factors. Using backward elimination, factors with a $p<0.1$ were included in the multivariable regression.

Results: A total of 489 patient records were reviewed. In the univariable regression, history of heart attack (CC: IRR=1.41, p=0.06/CO: IRR=1.47, p=0.03), CAD (1.89, <0.01/ 1.90, <0.01), hypertension (1.65, <0.01/ 1.80, <0.01), cardiac stent (2.52, <0.01/ 2.20, <0.01), PCI (2.55, <0.01/ 2.23, <0.01), atrial fibrillation (0.28, 0.02/ 0.51, 0.09), and hyperlipidemia (1.95, <0.01/ 1.79, <0.01) were significantly associated with both single and cumulative outcomes. In the multivariable regression only hypertension (1.47, 0.04/ 1.63, 0.005) was associated with both outcomes. Vital signs were not associated with either outcome.

Conclusion: Few factors in the prehospital record were associated with the need for advanced cardiac care. These data highlight the challenges prehospital providers face in attempting to differentiate patients reporting chest pain who do not have STEMI on EKG. Further work needs to be done to determine the best way to get prehospital chest pain patients to appropriate cardiac care when needed.

289 Prehospital and In-Hospital Chart Agreement for Patients with Chest Pain

Stephanie Outterson[1], Adam Jaque[2], Jestin Carlson[3], Brandon Kramer[3], Kenneth Heidle[3], Caroline Colleran[3], and Adam Frisch[2]
[1]The Sage Colleges, Troy, NY; [2]Albany Medical College, Albany, NY; [3]St. Vincent Medical Center, Erie, PA

Background: Regionalization of care and electronic health records, have made the transfer of information both in the in-hospital and prehospital settings easier and essential. Accurate transfer of information from prehospital providers to emergency department personnel is important for timely and best care for patients with acute medical conditions however, the consistency of this information is unknown.

Objectives: The objective of this study was to determine the agreement between patient history elements in matched in-hospital and prehospital records for patients complaining of chest pain.

Methods: We performed a retrospective chart review of prehospital and emergency department charts with a prehospital chief complaint of chest pain from a large urban EMS system. Patients transported to a single tertiary care facility with PCI and advanced cardiac capabilities were included. Specific past medical history pertinent to the chief complaint were identified in both records. We performed kappa statistics on each individual history component to determine levels of agreement between prehospital and in-hospital charts.

Results: A total of 563 prehospital and matched in-hospital charts were reviewed. History of diabetes (kappa=0.806) and CABG (0.797) showed high correlation. History of atrial fibrillation (0.539) and cardiac stenting (0.575) showed moderate correlation. Low correlation was seen with history of hypertension (0.389), cardiac disease (0.274), blood clots (0.304), and GERD (0.284).

Conclusion: A significant range of agreement was found between patient history elements in in-hospital and prehospital records. As regionalization and electronic synchronization of records become more prominent, ensuring accurate information transmission throughout the medical record is of increasing importance. Further research is needed to determine the causes of documentation discrepancy and methods of improving it.

290 Prehospital HEART Score Predictive of 30-Day Adverse Cardiac Events

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Background: The HEART score is a decision aid designed to risk stratify Emergency Department (ED) patients with acute chest pain. It has been validated for ED use, but has not been evaluated in the prehospital setting. If paramedics can use the HEART score to predict adverse cardiac events, it could be integrated into EMS (Emergency Medical Services) chest pain treatment and destination protocols.

Objectives: To determine if prehospital HEART scores can predict major adverse cardiac events (MACE) among undifferentiated chest pain patients transported to the ED.

Methods: A retrospective cohort study of patients with undifferentiated chest pain transported by Surry County EMS (from 11/2013-12/2014) and Forsyth County EMS (from 11/2013-6/2014) to Wake Forest Baptist Medical Center ED was conducted. Adult patients without evidence of STEMI on ECG were included, while inter-facility transfers, those without a prehospital ECG or a troponin measurement were excluded. Data from a prehospital registry and initial troponin measures were used to calculate HEART scores and each patient was risk stratified into a low-risk or high-risk group. MACE outcomes were determined by record review at 30 days. The negative and positive predictive values for MACE at 30 days were calculated. MACE was defined as death, myocardial infarction (MI), or coronary revascularization.

Results: Over the study period, 462 patients met inclusion criteria. MACE at 30 days was present in 12% (56/462) of patients with 7 deaths, 45 MIs, and 7 coronary revascularizations without MI. The HEART score identified 36% (167/462) of patients as low-risk. Among low-risk patients 2% (4/167) had MACE (3 MIs and 1 revascularization without MI). The negative predictive value of a prehospital HEART score for 30 day MACE was 98% (95%CI: 94%-99%) and positive predictive value was 18% (95%CI: 14%-22%).

Conclusion: Prehospital HEART scores have a high negative predictive value for MACE at 30 days. A study in which prehospital providers prospectively apply the HEART score is warranted.

291 The Effect of Obesity and Actual Patient Weights on Prefilled Medication Syringes Labeled with Color-Coded Volumes Based Dosing of the Broselow Tape to Conventional Methods of Drug Administration During Simulation

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Background: The Broselow length-based method weight estimation is believed to be one of the most reliable tools for pediatric resuscitations. A recent novel method to improve the accuracy and speed of drug dosing using prefilled syringes labeled with Broselow Tape color-coded weight volumes (PFSBT) was described in the literature. The study used two hypothetical case scenarios - an 8 month old and a 8 year old child - and demonstrated a decrease in critical medication dosing errors as well as improved drug delivery time.

Objectives: To determine dosing error of the Broselow tape prefilled syringes method using a single drug (epinephrine) compared with medication dose based on the actual patient weight obtained in inner city population in the United States.

Methods: The weight data used for this study was collected as part of previously published weight estimation study conducted as a prospective, non-blinded, observational study at a single institution in an inner-city, pediatric emergency department (Holtz Children's Hospital) in the United States. Data were obtained for a total of 324 noncritical patients randomly selected patients seen at Holtz Children's Emergency Department. We defined a critical medication dose error as $\geq$ 10% deviation from dose calculated with actual patient weight. Medication dose was calculated using epinephrine for a virtual scenario.

Results: The median age was 3 years (0.5-8). The overall mean percentage difference for the Broselow predicted medication dose and medication dose based on patient weight was -14.27%. In 55.6% of cases, there was a critical medication dose error using Broselow method compared with the actual weight. Age and body habitus were independent statistical significant factors associated with critical dose medication errors for the Broselow method in a logistic regression model.

Conclusion: The usage of Broselow tape color-coded prefilled syringe was associated with high percentage of medication dose error in our patient population. Although a novel and innovative method, the rate of obesity in our patient population would lead to an error of greater than ten percent in 55% of our patients. Alternative methods of drug delivery should be sought to control for obesity in the U. S. population.

292 Allowing Treatment of a Subset of Moderate Risk Patients in Low-Acuity Areas Can Eliminate Mismatch Between Demand and Segmented Capacity

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Background: The emergency severity index (ESI) is a five-level triage system used across the United States. Many EDs route patients with ESI 4 and 5 to a dedicated low-acuity area while higher-acuity patients (ESI 1, 2, and 3) are sent to the main ED. Studies have shown dedicating space for care of low acuity patients reduces their waiting times and lengths of stay, yet it can make the ED less responsive to periods of high demand by higher-acuity patients because capacity is sequestered away from the main ED. If there was a known group of patients who could be appropriately cared for in either the main ED or in a low acuity space, such patients could be routed according to volume drivers rather than simple acuity level.

Objectives: At our academic, urban ED, 48% of patients are classified as ESI-3. We posited that ESI-3 patients with expected length of stay (LOS) less than 120 minutes could be identified at triage and routed to the low-acuity area to reduce congestion in the main ED and increase use of the low-acuity care area. We hypothesized that routing these sub-groups to the low-acuity area improves overall patient flow.

Sample groups of ESI-3 patients who could be sent to the low-acuity area									
Chief Complaint	Age	Gender	Systolic BP	Diastolic BP	Pulse Rate	Temperature	Resp. Rate	SpO2	Means of arrival
Chest Pain	25-35	M/F	<189	-	<77	<99.4	17-21	-	Self
Cough	-	M/F	<155	-	81-89	-	-	93-95	-
Dizziness	25-36	M	>=143	-	<92	-	-	>=99	-
Dysuria	<75	M	-	-	<84	-	>=17	>=97	-
Dysuria	<75	F	-	-	81-106	-	>=17	>=97	-
Dysuria	<42	M/F	-	<97	<77	-	<17	-	-
Hematuria	<25	M/F	<186	<106	-	<99.9	<18	<99	Self
Shortness of Breath	<33	M	-	<112	<95	<98.9	-	-	-

Table 292: Torabi.

Methods: We extracted demographics, vital sign, and chief complaint data from the electronic medical record for 115,000 patient visits over 18 months. We used recursive partitioning methods to parse these data and identify sub-groups of ESI-3 patients who were discharged with a mean length of stay <120 minutes. To test the effectiveness of the proposed triage strategy, we simulated the ED using queuing models to compare the operational performance of the new routing policy to the status quo.

Results: We were able to identify groups of ESI-3 patients who could be sent to the low-acuity area based on our length of stay and discharge criteria (see examples in table). In simulation, the selective intake of these moderate-acuity, short-stay patients to minor care reduced the average waiting time of higher-acuity patients sent to the main ED by 50% and increased the utilization of the minor care area by 30%.

Conclusion: Increasing operational flexibility by identifying moderate-acuity patients who can be treated in a low-acuity area of the ED can improve the match between demand and treatment capacity in segmented areas, effectively eliminating the downside of sequestering low-acuity space from the main ED.

293 Utilizing the EMR to Reduce Unnecessary Ordering of Coagulation Studies for Patients with Chest Pain

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Background: Coagulation studies are often ordered in the initial evaluation of patients presenting to the ED with acute chest pain, despite evidence demonstrating increased cost without added benefit in the absence of very specific indications.

Objectives: Our goal was to reduce unnecessary ordering of PT/PTT for chest pain in the ED of a large academic medical center. We hypothesized this could be achieved via implementation of a stopgap measure in the electronic medical record (EMR).

Methods: This before and after study was performed between May and November 2014. In August 2014, a custom prompt was built into the EMR that appears each time coagulation studies are ordered, requiring clinicians to indicate which, if any, anticoagulant therapy patients are currently using with a single mouse click. Electronic records for all patients presenting with chest pain over a two-month period before and after intervention (with an intervening two-month washout period) were retrieved (n = 728 and n = 822, respectively). Representative samples, randomly selected for each time period (n = 103 and n = 104, respectively) were analyzed for frequency of PT/PTT ordering and indication. Orders were classified as necessary only if patients met any of the following criteria: Taking vitamin K antagonists, history of liver disease or known coagulopathy, initiation of anticoagulant therapy during ED treatment, or ED diagnosis of ST elevation myocardial infarction, hemorrhage or stroke. Frequency of total and unnecessary coagulation study orders was compared before and after intervention using chi-square analysis.

Results: Implementation of a stopgap measure in our EMR resulted in a significant reduction in ordering of PT/PTT for all patients with chest pain (73.8% before to 38.5% after, absolute reduction 35.3%, $p < 0.001$). Number of unnecessary PT/PTT orders was also significantly reduced (49.5% before to 23.1%, after, absolute reduction 26.4%, $p < 0.001$). Based on the cost of coagulation studies at our institution, this represents a potential cost reduction of more than $37,000 annually.

Conclusion: Single-click EMR stopgaps serve as effective deterrents to indiscriminate ordering of laboratory studies in the emergency department.

294 Not So Fast! Beta-Blockers Blunt Tachycardia in Pulmonary Embolism: Implications for Clinical Decision Rules?

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Background: Several pulmonary embolism (PE) decision rules incorporate heart rate (HR). The Wells criteria and the PE Rule-out Criteria (PERC) use a threshold of 100 bpm, whereas the PE Severity Index uses a threshold of 110 bpm. Many patients use beta-blockers (BBs), a drug class known to decrease HR. Little is known about how BBs affect the presenting HR in patients with PE, and potentially, change the outcome of PE-related clinical decision rules.

Objectives: To evaluate the effect of pre-arrival oral BB use on the HR, sBP, and oxygen saturation of ED patients with PE.

Methods: We retrospectively identified all patients with acute, objectively-confirmed PE across 21 community EDs between 1/2013 and 3/2015. We collected demographics, past medical, and current clinical characteristics during their ED visit. We used descriptive analyses to compare patients with vs. without pre-arrival BB use, defined by an outpatient prescription fill within the prior 150 days. The primary outcome was peak HR. Secondary outcomes included lowest sBP, prevalence of tachycardia at two thresholds (HR >100 and >110 bpm), and lowest oxygen saturation.

Results: Among 2,788 ED adults with acute PE, the median age was 65 years (IQR 42 to 88), and 50.1% were female. Overall, 25% of patients demonstrated pre-arrival BB use. BBs were associated with a lower mean maximal HR of 95 vs 101 bpm (difference 6 bpm; 95% CI 3-9) and a lower prevalence of tachycardia: >100 bpm, 36.2% vs 49.8% (difference 13.6% [95% CI 9.4%-17.8%]); and >110 bpm, 22.2% vs 32.4% (difference 10.2% [95% CI 6.5%-13.9%]). There were no significant differences in lowest sBP or lowest oxygen saturation.

Conclusion: We found that ED patients with acute PE on pre-arrival BBs have a lower maximal HR than those not using BBs, and less frequently cross defined thresholds for tachycardia. Further study

is needed to determine how BB use affects the clinical decision risk scores of patients with suspected and confirmed PE.

295 In Very Low Risk Chest Pain Patients, is Discharge from Emergency Department Without Stress Testing Cost Effective?

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Background: With an estimated 255,000 patients annually placed in ED observation for stress testing (CDU), identifying a very low risk population not needing stress testing (ST) may provide cost savings but would likely never achieve zero missed MI or death. With increasing health care costs, society may not be able to afford an environment in which all low risk patients are sent to CDU.

Objectives: Evaluate a cost-effectiveness analysis (including legal payouts for missed MI or Death), comparing standard treatment to a treatment that discharged very low risk CP patients without ST.

Methods: Data from Mahler et al: 'Can the HEART Score safely reduce ST and cardiac imaging in patients at low risk for acute coronary syndrome' and estimates on probabilities and costs derived from the literature were entered into TreeAGE software. Standard arm was CDU all low risk, and the HEART arm compared a protocol to discharge from the ED any patients meeting very low risk criteria (HEART score 0-3, 4-6 hr troponin normal) without ST, and CDU the rest. Analysis focused on cost for missed MI/Death. One-way, 2-way and probabilistic sensitivity (Monte Carlo) analysis was performed.

Results: The average cost/patient in the CDU arm was $2994 and $1850 in the HEART arm (cost savings of $1144/person). This could translate into more than $290 Million annual savings. The HEART arm resulted in a very minimal increase in missed MI/Death (0.0008) which could extrapolate to 194/236,276 missed MI/death annually. Monte Carlo analysis with 50000 iterations favored HEART over standard CDU 79% of the time. Two-way sensitivity analysis suggested that as the probability of MI/Death in those discharged without ST decreased the amount that could be paid out for legal consequences increased, with a 1 million payout occurring when missed MI/Death in the discharged population was 0.02%.

Conclusion: Physicians carry the burden for any missed MI/Death in the form of medical malpractice and are more likely to continue to CDU low risk CP patients. Society, however, currently pays for this 'no risk' medical practice. Given the increasing burden of health care costs, a continued 100% risk aversion medical practice for low risk chest pain patients may not be realistic and understanding the effects of discharging very low risk patients directly from the ED is important.

296 Emergency Department-Based Assessment of Palliative Care Needs in Adults with Heart Failure

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Background: Heart failure (HF) is associated with frequent emergency department (ED) utilization and hospitalizations. The application of palliative care in HF can reduce ED visits and hospitalization but the prevalence of palliative care needs among HF patients in the ED has not been reported.

Objectives: To determine and characterize unmet palliative care needs in a random sample of adults with HF seeking care in the ED.

Methods: Data on palliative care needs were collected using the validated Screen for Palliative and End-of-Life Care Needs in the Emergency Department (SPEED) Instrument, a 13-question palliative care symptom assessment tool covering social, therapeutic, physical, psychological and spiritual domains using a 10-point scale to score each question. For 5 of the 13 questions, threshold scores indicating a need for palliative care consult were previously derived from ED cancer patients.

Results: The mean age of all 81 participants was 67 years (50 to 93 years). Forty-seven (58%) were female and forty-six (57%) were African American. The highest scores across instrument items were observed for pain, shortness of breath and other physical symptoms. African Americans reported a significantly higher pain score compared with whites (6.8 vs. 5.1, p=0.028). Women rated their pain (3.7 vs. 3.1, p=0.019) and their depression (4.0 vs. 3.5, p=0.006) higher than men. African Americans (83% vs. 57%, p=0.012) and women (83% vs. 56%, p=0.008) had a higher proportion of respondents meeting the threshold score for pain. Individuals who reported any depression (48%) also reported a higher score for pain (6.9 vs. 5.3, p=0.042), shortness of breath (7.5 vs. 5.0, p=0.002), difficulty with their medications (1.8 vs. 0.5, p=0.043), difficulty with outpatient follow-up care (2.1 vs. 0.7, p=0.036), anxiety (5.8 vs. 1.8, p<0.001), feeling overwhelmed (5.0 vs. 2.3, p=0.002) and feeling that their medical condition seemed senseless or meaningless (4.5 vs. 2.4, p=0.022) than those without depression.

Conclusion: Adults with HF seeking care in the ED had significant symptom burden indicating a need for palliative care. We observed disparities among women, African Americans and individuals with self-reported depression, all of whom had higher symptom burden and should be prioritized for palliative care assessment.

297 Do Uninsured Patients in Illinois Have Higher Mortality After Trauma?

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Background: Being uninsured is associated with higher mortality after trauma. With the implementation of the Affordable Care Act, ACA, in Illinois there has been an approximately 25% decrease in uninsured patients.

Objectives: The objective of this study is to evaluate whether insurance-related mortality disparities have continued through the period of ACA insurance expansion in Illinois.

Methods: We obtained hospitalization claims data from all non-federal hospitals in Illinois from mid-2010 through first-quarter 2015. Cases were identified as those with trauma-related ICD-9 codes and an E-CODE pertaining major mechanisms of trauma (cut/pierce, fall, gunshot wound, motor vehicle collision, or other blunt injury). We employed poisson regression adjusted for clustering within hospitals and controlling for age, sex, race, zip code household median income, mechanism of injury, shock, extent of anatomic injury, comorbidities, hospital ED volume, and year of admission.

Results: A total of 87, 537 patients met trauma inclusion criteria. Uninsured patients dropped from approximately 20% to 8% over the

Figure 1. Mortality rates by insurance states during the period of Affordable Care Act insurance expansion

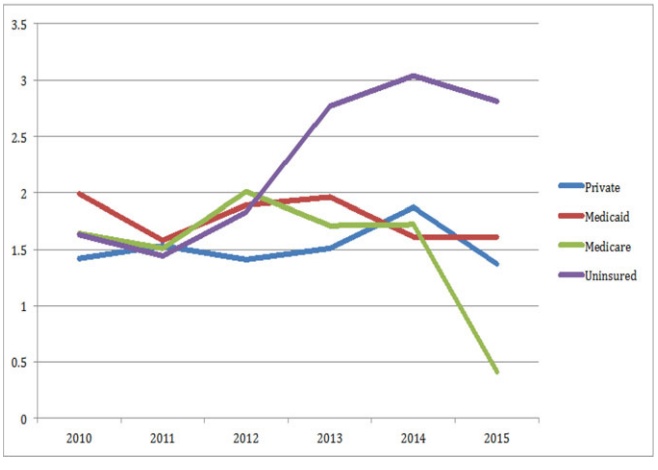

Figure 297 – Logan

study period. Crude mortality increased among uninsured patients over this time period as well (Figure 1). The adjusted incidence rate ratio after trauma was higher 1.19 (95%CI 1.02 to 1.39), among uninsured patients when compared with privately insured patients.

Conclusion: Uninsured patients continue to suffer a higher burden of mortality after the implementation of the ACA. While there is an overall reduction in number of uninsured trauma patients, uninsured patients continued to fare worse after trauma and the mortality rate within this patient population appears to be increasing. This elevated burden of mortality may reflect patient factors, hospital or provider factors, or as yet unmeasured confounders.

298 Choosing Wisely Canada®: Five Tests, Procedures and Treatments to Question in Emergency Medicine

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Background: Choosing Wisely Canada® (CWC) is a resource stewardship initiative to encourage discussions between patients and physicians about the appropriate, evidence based use of medical tests, procedures and treatments.

Objectives: This report presents the Canadian Association of Emergency Physicians' (CAEP) top five list of recommendations, and the process undertaken to generate them

Methods: The CAEP Expert Working Group (EWG) used a consensus building technique to generate a candidate list of 52 tests, procedures, and treatments in emergency medicine whose contribution to care was questioned. This list was distributed to CAEP committee chairs and revised to 47 candidate items. The list was divided and randomly allocated to 107 selected Canadian emergency physicians to vote on each item based on: action-ability by emergency physicians, effectiveness, safety, economic burden, and frequency of use. The EWG discussed the items with the highest votes, and generated the top five CWC recommendations by consensus.

Results: The top five CAEP CWC recommendations are: 1) Don't order CT head scans in adults and children who have suffered minor head injuries (unless positive for a head injury clinical decision rule); 2) Don't prescribe antibiotics in adults with bronchitis/asthma and children with bronchiolitis; 3) Don't order lumbosacral spinal imaging in patients with non-traumatic low back pain who have no red flags/ pathologic indicators; 4) Don't order neck radiographs in patients who have a negative examination using the Canadian C-spine rules; and 5) Don't prescribe antibiotics after incision and drainage of uncomplicated skin abscesses unless extensive cellulitis exists.

Conclusion: Using a mixed methods approach, the EWG has produced a simple and practical top five list for Emergency Medicine all of which are supported by strong evidence. The list was released at the CAEP Conference in Edmonton on June 2, 2015.

299 Simulation and Web-Based Learning Increases Utilization of Bier Block for Forearm Fracture Reduction in the Pediatric Emergency Department

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Background: Bier block (BB) regional intravenous anesthesia is a safe and effective alternative to procedural sedation for analgesia during forearm fracture reductions, yet BB remains infrequently utilized in the Pediatric Emergency Department (PED). No standardized methods of BB training have previously been described.

Objectives: The objectives of this study were to evaluate comfort and level of experience with BB in the PED, and to determine if a multimodal instructional course increases these from baseline and translates to increased utilization of this technique.

Methods: A novel interdisciplinary simulation and web-based training course was developed to teach the use of BB for forearm fracture reduction at a tertiary PED. Participants were surveyed pre/ post training, and at 2- and 6-months regarding their comfort with and willingness to use BB. In parallel, we prospectively assessed the clinical utilization of BB in the PED during the 24-month period immediately following course completion.

Results: Course participation included 38 members of the PED (N = 26 physicians, 12 nurses), and survey response rate was 100% at all time points. Respondents reported that course participation increased both their comfort (10% pre vs. 89% post-training, $p<0.001$) and willingness (51% pre vs. 95% post-training, $p<0.001$) to use BB for forearm fracture reduction, an effect that was sustained at 6-months following course completion (66% and 92%, respectively, $p<0.001$ for both). Before course attendance, only 6% of respondents indicated that they had ever used BB in a PED setting, and all participants indicated that the course addressed their learning objectives. In clinical practice, there were no BB performed prior to course administration. We observed a consistent and sustained increase in the clinical utilization of BB, with 39% of all PED forearm reductions performed using BB at 24-months post-course completion (114 BB, 17 unique physicians).

Conclusion: A combined simulation and web-based training course increased comfort and willingness to use BB and was associated with increased utilization of this technique for forearm fracture reduction in the PED.

300 Language Barrier Affect on Providing Timely Pain Management for Long Bone Fractures in a Pediatric Emergency Department

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Background: Long bone fractures are common painful conditions managed in the pediatric emergency department (PED). Oligoanalgesia and delay to providing effective pain management are commonly encountered in treating children, especially in those among ethnic minorities. There is limited information regarding how the issue of language spoken impacts on provision of adequate and timely institution of analgesia.

Objectives: To determine whether there is a measurable difference between English speaking and non-English speaking patients with respect to time to pain management for long bone fractures in a multi-ethnic urban PED.

Methods: We conducted a retrospective study of consecutive cases over 29 months of children <18 years old who presented to the PED with a first-time long bone fracture. All charts were reviewed to document health care provider assessing pain score and providing analgesia, with time from triage recorded. A correlation of multiple clinical variables with timeliness to providing analgesia as a primary outcome was performed. Regression analysis was performed to eliminate confounding and to determine the magnitude of each variable's effect on the outcome.

Results: A total of 753 patient cases were analyzed. Results show that English vs. non-English language spoken was the most significant

predictor of timeliness to pain management [R^2: 0.054-0.178, p<0.001]. There was a significant difference for English vs. non-English speakers in median time to triage measurement of pain score [1 minute vs. 4 minutes (p<0.001)]; median time to initial analgesia [4 minutes vs. 13 minutes (p<0.001)]; and median time to opioid analgesia [32 minutes vs. 115 minutes (p<0.001)], respectively. Just 30% of all patients received an opioid analgesic, including only 37% with a triage pain score ≥4.

Conclusion: Oligoanalgesia remains common in PED patients with long bone fractures. Time to providing analgesia is significantly delayed in children who come from non-English speaking families. With the rapid expansion of the portion of the US population having limited English proficiency, this places these children at risk for disproportionately inadequate care in the PED. Furthermore, use of opioid analgesia for fractures in children remains poor.

301 Effectiveness of Ultrasound in Identifying Pediatric Hand Fractures

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Background: Traumatic hand injuries are a common complaint seen in the pediatric emergency department (PED). Despite increased point of care ultrasound (POCUS) usage in the PED, hand radiographs are often done to diagnose these fractures. The benefits of ultrasound include and not limited to, real-time imaging, scanning in different planes, decreased length of stay, and decreased exposure to radiation. An adult study in 2013 reported high sensitivities and specificities regarding the diagnosis of the 5th metacarpal fractures. A recent European study looked at the pediatric population with regards to identifying fractures within the hand. They found sensitivities and specificities greater than 90%.

Objectives: To evaluate the effectiveness of ultrasound in detecting pediatric hand fractures compared to radiographs.

Methods: This is a prospective observational study of patients under 21 years for evaluation of a hand fracture in an urban teaching PED. Exclusion criteria includes those who had a previous fracture over the same bone of interest, suspicion of an open fracture and those whose injury occurred more than 7 days prior to presentation. A trained pediatric emergency medicine (PEM) fellow would perform POCUS examination of the injured area in as many planes as available to determine if there was a fracture. A data sheet recorded the treating physician's pre-test probability of a fracture, as well as the sonographers. The radiologist's final readings were considered the reference standard.

Results: A total of 88 patients have been enrolled to date. 32 hand fractures have been identified radiographically and ultrasound was able to detect 21 of these fractures. Out of the 56 negative hand fracture studies, ultrasound reported there were 10 fractures. Sensitivity and specificity were found to be 66% (95% CI = 56% to 76%) and 82.1% (95% CI = 74% to 90%) respectively. The calculated positive predictive value was 68% (95% CI = 58% to 78%) with a negative predictive value of 81% (95% CI = 72% to 89%). This study yields a positive likelihood ratio was 3.68 (95% CI = 3.03 to 6.80) with a negative likelihood ratio of 0.42 (95% CI = 0.37 to 0.47).

Conclusion: It is questionable whether ultrasound can replace radiographs in the evaluation for pediatric hand fractures.

302 Current Use of Steroids in Pediatric Traumatic Brain Injury

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Background: The American Academy of Pediatrics published guidelines in 2003 and again in 2012 recommending against the use of corticosteroids for pediatric traumatic brain injury (TBI).

Objectives: Examine trends in the use of steroids in pediatric TBI and assess the association between steroid use and mortality.

Methods: Retrospective analysis from 2007-2014 using the Pediatric Health Information System (PHIS) national database. Children ages 0≤18 years with moderate/severe TBI were included. Children with a concurrent spinal cord injury were excluded. Steroid use was trended with the Cochran-Armitage test, chi-square was used to identify variation in mortality among those children with and without a chronic medical condition (CMC), and GEE methodology was used to identify predictors of mortality.

Results: A total of 49693 children were admitted for moderate/severe TBI and 1734 (3.5%) died. Patients had a mean age of 5.4 years (SD ±5.5) and 17.6% had a CMC. A total of 5702 (11.5%) children received steroid during hospitalization, and this proportion did not change during our study period (Z= -.07, p=0.48). The proportion of children who received steroids was significantly higher among those who died vs lived (34.4% vs 10.6%, p<0.0001). After controlling for a CMC, the proportion of children who received steroid was still higher among those who died vs lived (36% vs 30.8%, p=.0002). After adjusting for hospital clustering, CMC, age, and year, steroid use was still significantly associated with an increased risk of mortality (OR: 1.75, p=0.001).

Conclusion: Despite level II recommendations against steroid use in pediatric TBI, there is continued use across the country. Within the PHIS database, steroid use is significantly associated with an increase in mortality following moderate/severe TBI.

303 Can QuickBrain MRI Detect Acute Pediatric Traumatic Brain Injuries?

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Background: The current gold standard imaging modality for pediatric traumatic brain injury (TBI) is computed tomography (CT), but carries risks associated with ionizing radiation. QuickBrain magnetic resonance imaging (qbMRI) is a rapid brain MRI protocol that has been studied in the setting of hydrocephalus, but its ability to detect traumatic injuries is unknown.

Objectives: The objective of this study was to determine the sensitivity and specificity of qbMRI in detecting radiographic pediatric TBI.

Methods: This was a retrospective cohort study of pediatric trauma patients undergoing evaluation for TBI at a single Level I trauma center from 2/2010 to 12/2013. Patients who underwent CT imaging of the head as well as a qbMRI during their acute hospitalization were included. Images were independently reviewed by 2 neuroradiology fellows blinded to patient identifiers. Image review consisted of the identification and intracranial compartment of traumatic mass lesions, and the presence or absence of midline shift. CT imaging was considered the gold standard.

Results: A total of 54 patients met inclusion criteria with a median age of 3.24 years, 65% were male and 74% were noted to have a Glasgow Coma Scale of 14 or greater. The sensitivity and specificity of qbMRI to detect any lesion was 85% (95% CI: 73, 93) and 100% (95% CI: 61, 100) respectively; the sensitivity increased to 94% (95% CI: 81, 98) for clinically important TBIs as previously defined. The mean time interval between CT and qbMRI was 27.5 hours with approximately half obtained within 12 hours.

Conclusion: In this retrospective pilot study, qbMRI demonstrated reasonable sensitivity and specificity for detecting radiographically and clinically important acute pediatric TBI.

304 Optimal Imaging Modality for Suspected Cranial Shunt Failure in Pediatrics: A Clinical Decision Analysis

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Background: Children with cranial shunts receive 2-3 computerized tomography scans (CT's) a year as routine surveillance and/or evaluation for shunt failure. Fast sequence MRI (fMRI) has emerged as a viable, alternative imaging modality, that does not carry long-term risks of radiation.

Objectives: We sought to determine the optimal initial imaging modality for evaluation of suspected shunt failure in pediatric patients with a cranial shunt.

Methods: We constructed a decision analysis tree for a hypothetical population of patients younger than 19 years with suspected shunt failure, using 2 strategies: screening CT scan or fMRI. (Figure) For model inputs, we used current literature to obtain test characteristics of imaging, pretest probability of shunt malfunction, estimated long-term risks of malignancy and number of CT scans performed over first 18 years of life. (Table) We used published utilities and conducted 1 and 2-way sensitivity analyses to determine the optimal strategy for evaluation of suspected shunt malfunction.

Results: In our base model of a population of children with cranial shunt, the expected value of a CT dominated fMRI, making it the optimal management strategy. Univariate sensitivity analysis was conducted to ascertain independent factors that alter the dominant strategy. If the pretest probability of shunt failure is less than 34% or risk of radiation induced cancer per CT scan is greater than 0.3%, fMRI is the preferred diagnostic imaging modality. Threshold analysis revealed that if the child receives a lifetime exposure to a radiation equivalent of more than 1.5 CT scans, fMRI is the dominant strategy.

Conclusion: Our model highlights that in a hypothetical pediatric population with moderate to high pretest probability of cranial shunt failure, CT scanning is the preferred test. However, rapid MRI is preferred in children who are expected to receive more than 1.5 cranial CT's, because of a higher lifetime attributable risk of radiation induced cancer.

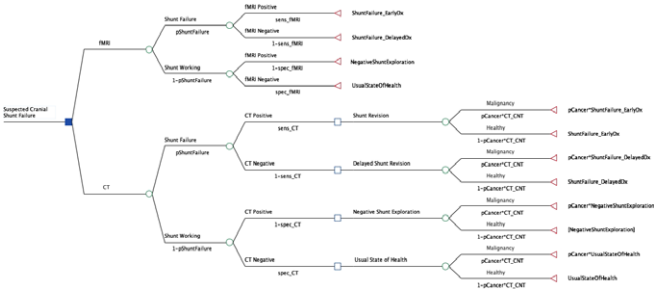

Figure 304 – Pershad

305 The Absence of Fever Predicts Higher Mortality and Decreased Antibiotic and Intravenous Fluid Administration in Emergency Department Patients with Septic Shock

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Background: Fever is a common, but incompletely reliable predictor of infection.

Objectives: This study assesses differences in in-hospital mortality and ED management for patients with septic shock based on presence or absence of fever in the ED.

Methods: This is a secondary analysis of a prospective, observational study of patients with shock in a 55,000 annual visit, urban, academic ED. The initial study enrolled 700 consecutive ED patients, from November 11, 2012 to September 23, 2013 who were > 18 years old, with shock, defined as 1) new vasopressor requirement, 2) sBP < 90 mmHg after at least 1 L intravenous fluid (IVF) or 3) sBP < 90 mmHg and IVF held for fluid overload. The current study limits analysis to patients with septic shock determined by physician review of the inpatient record (kappa=0.92). The primary outcome was in-hospital mortality. Secondary outcomes were ED administered antibiotics and IVF volume. Patients were grouped by the presence or absence of fever, defined as patient reported fever in ED physician note or measured temperature > 100.4° F in the ED. Rates of primary and secondary outcomes were compared between patients with and without fever using chi-square and Student's t-test. A multivariate logistic regression model was created to characterize the relationship between measured or reported fever in the ED and mortality.

Results: Of 700 patients with shock, 378 (54%, 95% CI 50.3-57.7) had septic shock, with an overall mortality of 20.9% (16.8 - 25.0%). Of these, 207/378 (54.8%, 49.7 - 59.8) met fever criteria. Patients without fever had lower rates of antibiotic administration in the ED (80.7% vs 93.7%, p<0.01), received a lower mean volume of IVF (2607mL vs 3013mL, p<0.01), and had a higher in-hospital mortality rate (32.8% vs 11.1%, p<0.01) compared to septic shock patients with fever. In the logistic regression model predicting in-hospital death, after adjusting for bicarbonate <18mEq/L, lactate > 4.0mmol/L, RR > 24, ED antibiotics, and IVF (AUC = 0.83), the absence of a reported fever (OR 5.2, 2.3 - 11.9, p<0.01) or measured fever (OR 2.5, 1.3 - 5.2, p<0.01) remained predictors of mortality.

Conclusion: Of ED patients with septic shock, the absence of fever is associated with higher in-hospital mortality and lower rates of ED antibiotics and IVF. Delayed interventions may contribute, but do not fully explain the mortality difference between groups.

306 Translational Rat Model Identifies Vocalizations as a Screening Target and Oxytocin Expressing Neurons as a Treatment Target of Cocaine-Induced Maternal Neglect

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Background: Maternal gestational cocaine use has been associated with maternal neglect and dysfunctional crying behavior in both animal and human studies. Currently, there are no highly-predictive-EM-compatible screening tools for substance-abuse-induced neglect. Nor do current therapies have high enough benefit-to-risk ratios to prevent many neglect-mediated-ED visits.

Objectives: Goals for these experiments were: 1) quantify differences in cocaine-exposed postnatal day 1 (PND1) infant rat vocalizations 2) test whether cocaine treatment decreases maternal preference-like behavior for recorded cocaine-exposed PND1 rat vocalizations; and 3) correlate any cocaine-induced changes in preference-like behavior with cocaine-induced changes in number of oxytocin expressing neurons in the hypothalamus, a known site of regulation of maternal behavior.

Methods: Nulliparous females were untreated or chronic cocaine (15 mg/kg BID) treated. Postpartum, mothers were tested in a three chamber apparatus for proximity preference to vocalization recordings. Mothers' brains were collected after testing and processed for oxytocin immunohistochemistry. Two-way ANOVA's were completed where cocaine-exposure was a factor and analyzed vocalization characteristics or numbers of oxytocin expressing neurons where the other factor. Considering the non-normal distribution of the proximity preference-like behavior data, these data were analyzed using generalized linear models.

Results: Cocaine-exposure decreases vocalization amplitude variation ($F(1,42)=4.27$, $p<0.05$) and vocalization wave-form-complexity ($F(1,42)=4.11$, $p<0.05$). Concomitantly, cocaine-treatment decreases maternal preference-like behavior for recordings of cocaine-exposed PND1 rat vocalizations that had less vocalization amplitude variation and fewer

complex wave-form vocalizations than an untreated PND1 rat vocalizations recording ($\chi 2(2,n=48)=4.34$, $p<0.05$). Lastly, cocaine-treated mothers had fewer oxytocin expressing neurons in the hypothalamus than untreated mothers ($F(3,33)=6.24$, $p<0.01$).

Conclusion: These data argue for continuing work to develop ED screening tools for neglect (infant vocalization analysis tools) as well as pharmacotherapeutics (oxytocin receptor agonists) to prevent neglect-mediated-ED visits.

307 Splenic Ultrasound Findings in Patients with HIV and TB: A Systematic Review of the Literature

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Background: The surge of HIV and tuberculosis (TB) co-infection is of particular significance in the developing world or geographic regions with high refugee density. It is estimated that about 1.2 million people worldwide are affected. Diagnostic resources for TB and HIV are limited in low-income countries and diagnosing extra-pulmonary TB (EPTB) can be particularly challenging. Clinicians have advocated for the integration of point of care ultrasound (POCUS) to aid in diagnosis of EPTB in this setting, as it is portable and cost effective. Studies show that splenic POCUS for detection of parenchymal splenic abscesses in EPTB is a frequent finding. Studies evaluating the accuracy of these findings are lacking.

Objectives: Our goal was to review published literature evaluating the frequency of detection of focal splenic lesions on POCUS in patients with confirmed HIV and EPTB.

Methods: We performed a systematic review of PubMed, EMBASE, Web of Science, CINAHL, LILACS, and AIM publications to August 7, 2015. Keywords and search terms were generated for TB and ultrasound. The database was further refined with addition of HIV keywords. Two independent reviewers screened abstracts for inclusion. Inter-rater agreement was assessed using Cohen's Kappa test. A third reviewer was used when conflicts arose to gain consensus. Articles included for full review were assessed with the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool.

Results: Database screening resulted in 3687 initial articles, with 511 abstracts identified for HIV and TB (Figure 1). Reviewers identified 40 articles pertaining to splenic ultrasound in patients with HIV and TB co-infection. Reviewers had a Kappa of 0.886 (95% CI, 0.671-1.00). After QUADAS tool was applied, 6 studies assessing splenic POCUS on 448 patients were selected for data extraction. We found POCUS detected splenic lesions in 111 patients

Conclusion: Splenic lesions detected with POCUS in patients with HIV and TB seem highly suggestive of active EPTB dissemination and findings should initiate treatment.

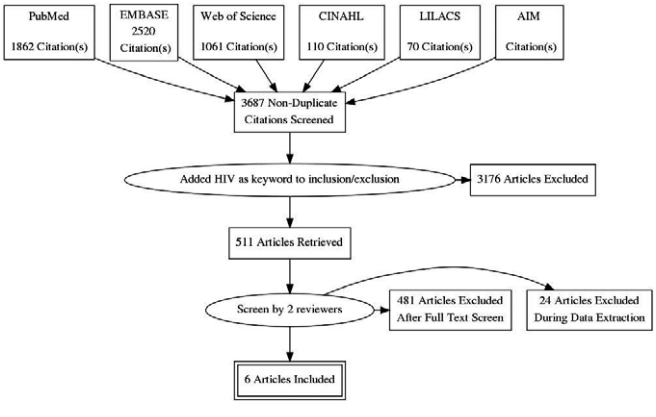

Figure 307 – Schafer

308 Risk Factors for Isolated Femoral and Deep Femoral Vein Thromboses

Fields Jason Matthew[1], Shruti Chandra[1], Carl Alsup[1], Julie Gianakson[1], Kunai Desai[2], and Arthur Au[1]
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Background: A dilemma of two point limited compression ultrasound is the potential to miss atypical deep vein thrombi (aDVTs) isolated to either the femoral or deep femoral veins. It is possible that aDVTs are associated with specific demographics or symptoms, but this has not been studied.

Objectives: The current study set out to identify clinical variables associated with the presence of aDVTs.

Methods: This was a retrospective study of two EDs with an annual census of 100,000. Patients who had Radiology ultrasound and a diagnosis of DVT between 2011-2014 were included. Patients were excluded if the DVT was not an acute proximal DVT of the lower extremity. Chart review was performed by two trained research associates and demographic and clinical variables were extracted using a standardized data collection tool. Standard descriptive statistics were performed.

Results: 748 patients were identified with 464 patients having acute proximal DVTs for analysis. The mean age was 61 years (SD 18) and 52% (239/464) were male. There were 23 cases (5.0%, 95CI 3.2-7.4%) of aDVTs (20 isolated femoral vein and 3 isolated deep femoral). The only variable found to be significantly associated with aDVT was pain localized to the thigh (table 1).

Clinical variables associated with isolated femoral or deep femoral DVTs

Variable	All Patients (n=464)	Isolated Femoral or Deep Femoral DVTs (n=23)	All other proximal DVTs (n=441)	p-value
Elderly (age > 65)	43% (197)	57% (13)	42% (184)	0.16
Male Gender	52% (239)	35% (8)	49% (217)	0.18
Obesity	37% (173)	30% (7)	38% (166)	0.49
History of DVT	36% (165)	48% (11)	35% (154)	0.21
History of Cancer	22% (103)	35% (8)	22% (95)	0.14
Immobility	10% (44)	9% (2)	10% (42)	0.90
Inguinal Pain	4% (20)	9% (2)	4% (18)	0.28
Thigh Pain	10% (44)	22% (5)	9% (39)	0.04
Knee Pain	9% (41)	13% (3)	9% (38)	0.47
Calf Pain	14% (67)	9% (2)	15% (65)	0.42

Table 308: Matthew.

Conclusion: Our study corroborates the findings of previous studies for a non-negligible (5%) incidence of aDVTs. Of patients with acute proximal DVTs, thigh pain is more commonly associated with aDVTs, however whether this finding can be used to guide imaging strategies requires prospective evaluation.

309 A Standardized Handoff Tool in an International Environment: Encouraging Efficient, Face-to-Face Handoff of Patients from Emergency Medicine to Internal Medicine

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Background: Standardized handoffs reduce communication errors that can impact patient safety and are integral to Joint Commission International accreditation. While emergency medicine (EM) change-of-shift handoff practices have been studied, research on EM to internal medicine (IM) handoff is lacking, especially in international and community settings.

Objectives: Our study at the Al Rahba Hospital in Abu Dhabi, staffed by EM physicians from 9 different countries, characterized existing handoff practices for admitted patients, developed a standardized handoff tool, and assessed its impact on communication.

Methods: After ethical review board approval, EM physicians completed an anonymous survey regarding handoff. Trained observers utilized a checklist based on the Systems Engineering Initiative for Patient Safety model to observe 40 patient handoffs. EM and IM physicians used these findings to collaboratively develop and implement a written tool encouraging bedside handoff. Handoff was streamlined from 6 possible pathways to 3. Surveys of EM physicians and 40 observations were repeated.

Results: Initial observations found 78% of handoffs occurred face-to-face, with 43% at bedside, and in 3 different languages. Most initial survey respondents (89% response rate) thought face-to-face handoff was safest and most efficient, ideally lasting 5-10 minutes. Respondents noted 9-13 patients suffering harm due to handoff in the prior month.

Fig 1. EM physician perceptions of new handoff tool and process

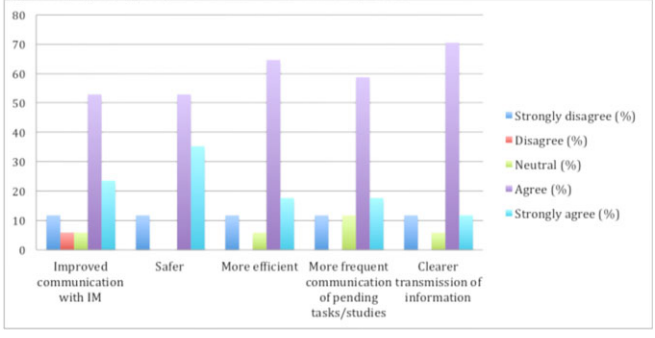

Figure 309 – Balhara

Table 1. EM physician perceptions of handoff practices

	Before - % of respondents (16)	After - % of respondents (18)
Time spent on handoff p=0.219		
< 5 minutes	18.75 (3)	16.67 (3)
5-10 minutes	37.5 (6)	61.11 (11)
11-15 minutes	12.5 (2)	16.67 (3)
16-20 minutes	6.25 (1)	5.56 (1)
>20 minutes	25.00 (4)	0.00 (0)
Issues with missing or incomplete information p=0.501		
Never	18.75 (3)	27.78 (5)
Rarely	25 (4)	38.89 (7)
Sometimes	56.25 (9)	33.33 (6)
Most of the time	0 (0)	0(0)
Always	0 (0)	0 (0)
Issues with inaccurate information p=0.167		
Never	25 (4)	27.78 (5)
Rarely	43.75 (7)	66.67 (12)
Sometimes	31.25 (5)	5.56 (1)
Most of the time	0 (0)	0 (0)
Always	0 (0)	0 (0)
Inefficiency of process p=0.008		
Never	18.75 (3)	33.33 (6)
Rarely	25.00 (4)	61.11 (11)
Sometimes	50.0 (8)	5.56 (1)
Most of the time	0.00 (0)	0.00
Always	6.25 (1)	0.00
Frequency of interruptions p=0.522		
Never	6.67 (1)	16.67 (3)
Rarely	33.33 (5)	50.00 (9)
Sometimes	53.33 (8)	27.78 (5)
Most of the time	6.67 (1)	5.56 (1)
Always	0.00 (0)	0.00 (0)
Overall quality p=0.820		
Poor	13.33 (2)	5.56 (1)
Fair	26.67 (4)	22.22 (4)
Good	60.00 (9)	55.56 (10)
Excellent	0.00 (0)	16.67 (3)

Table309: Balhara.

After handoff tool implementation, 98% of observed handoffs occurred face-to-face, with 83% at bedside ($p<0.05$). All handoffs were completed in English. Average duration was 6.35 minutes. In the post intervention survey (100% response rate), 72% reported always using the new form and 82% reported it improved workflow. Most agreed it positively impacted efficiency and communication (table 1 and fig 1) and none reported patient harm.

Conclusion: Our standardized tool increased face-to-face and bedside handoff. While impact on patient outcomes could not be measured directly, EM physicians perceived greater safety. The new process met expectations of duration (5-10 minutes) and was perceived as positively impacting workflow and communication. Standardized, inter-specialty handoff can be successfully implemented in international settings, with improvements in physician perceptions of safety, clarity, and efficiency.

310 External Validation of the DHAKA Score for Diagnosing Severe Dehydration in Children with Acute Diarrhea

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Background: Acute diarrhea remains both common and deadly in children worldwide. Proper treatment depends on accurately assessing dehydration status. Current World Health Organization (WHO) guidelines include an algorithm for classifying children as having no, some, or severe dehydration, which has never been prospectively validated. The Dehydration: Assessing Kids Accurately (DHAKA) study recently derived a new scoring system for dehydration in children, but it also requires external validation.

Objectives: Validate the DHAKA Score in a new population of children with acute diarrhea and compare its accuracy to the WHO algorithm.

Methods: This study enrolled a random sample of children with acute diarrhea at an urban hospital in Bangladesh. Local nurses prospectively applied both the DHAKA score and WHO algorithm to children on arrival and obtained serial weights as they were rehydrated. The percent weight change with rehydration was used to classify subjects with severe (>9%) dehydration, some (3-9%) dehydration, or no (<3%) dehydration, based on standards in the pediatric literature. Test characteristics and the area under receiver-operator characteristic curves (AUC) were calculated and compared for both diagnostic tools.

Results: 546 children were enrolled, with 488 included in the final analysis. 48% of children had no dehydration, 38% had some dehydration, and 14% had severe dehydration. The DHAKA score had an AUC of 0.77 compared to 0.72 for the WHO algorithm for the diagnosis of severe dehydration ($p=0.001$), and an AUC of 0.84 compared to 0.62 for the diagnosis of any dehydration ($p<0.001$). The DHAKA score had a sensitivity of 86% and specificity of 54% for diagnosing severe dehydration and 93% and 50% for diagnosing any dehydration.

Conclusion: The DHAKA score is the first dehydration assessment tool both derived and validated in a resource-limited setting, and outperformed the WHO algorithm. Frontline providers may now use this new tool to better manage acute diarrhea in children worldwide.

311 Predictors of Follow-Up in a Transitional Care Clinic After Emergency Department Discharge

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Background: Transitional care clinics (TCC) represent one strategy to provide urgent follow-up and primary care linkage for patients discharged from the emergency department (ED).

Objectives: To assess factors associated with completion of follow-up among patients who were provided with appointments to a TCC at time of ED discharge and characterize their subsequent ED utilization.

Methods: Demographic, clinical, and visit level factors were abstracted from the medical record for a random sample of 660 patients referred to the TCC. Data were then linked to the Washington state ED Information Exchange to characterize ED utilization after referral. Multivariate logistic regression was used to determine predictors associated with completion of follow-up.

Results: Among the cohort, 50% completed follow-up in the TCC with a mean time to follow-up of 6.9 days. Non-English language (OR 2.21, CI 1.30- 3.75) was the only variable significantly associated with completion of follow-up, however, homeless patients (OR 0.42, CI 0.26 - 0.66), those with a history of substance use (OR 0.68, CI 0.45 - 1.00), and those with higher rates of baseline ED use in the year preceding referral (OR 0.94, CI 0.89-0.99) were significantly less likely to complete follow-up. The number of days between the ED visit and follow-up appointment was not associated with completion. Across the entire cohort there was an average of 3.1 ED visits per patient in the year after ACC referral, with 23.8% having a revisit within 30-days and 56.1% having any revisit in the subsequent year. Patients who completed their ACC appointment were significantly less likely to have a repeat ED visit within 30-days (17.9% vs. 29.7%, p-value < 0.001) or 1-year (50.0% vs. 62.1%, p-value = 0.002) compared with those who did not complete their appointment. They also had lower ED utilization overall, with an average of 1.9 versus 4.3 repeat visits (p-value<0.001) per person.

Conclusion: As more attention focuses on improving transitions of care in the acute setting, EDs will need to develop novel interventions like TCCs to facilitate timely follow-up after an ED visit and link patients with primary care.

312 Emergency Physician Empathy and Variation in CT Imaging Use

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Background: Variation in emergency physician (EP) CT imaging use is well described. Little is known about physician features that explain this variation. The characteristics of EP empathy have not been quantified.

Objectives: To describe EP empathy, risk taking, stress from uncertainty, and fear of malpractice and evaluate for associations with variation in CT use.

Methods: This cross-sectional study included two phases: (1) a secondary analysis of an observational cohort study of CT imaging utilization data and (2) a survey study of the cohort of physicians from the first phase of the study using 4 psychometrics: the Jefferson Scale of Empathy (JSE), a risk-taking subset of the Jackson Personality Index (RTS), the stress from uncertainty scale (SUS), and the fear of malpractice scale (FMS). The study was conducted in a health system including 4 EDs: 1 urban, academic ED, 2 community EDs and 1 free-standing ED. Surveys were administered on paper. Subjects were verbally consented. To test for selection bias, demographics of the 74 EPs included in the analysis were compared with non-responders. A mixed-effects regression model was used to evaluate the association between EP performance on the four psychometric scales and risk-adjusted CT imaging utilization. The model was designed to calculate physician-specific CT utilization rates adjusted for propensity scores that were calculated using over 500 patient-level variables via random forest methods, physician demographics, and a random provider effect to account for the clustering of observation.

Results: 74/82 (90.2%) EPs responded to the survey. No significant differences were found between the responders and non-responders. CT variation analysis included 113,517 patients seen in one year by these 74 EPs and 20,972 (18.5%) of these patients had at least one CT. RTS, SUS, and FMS scores did not correlate with JSE. Plots of the

Table 1. Elliott: Characteristics of patients receiving referrals to the After Care Clinic (ACC) from the ED, stratified by completion of follow-up

	All ACC Referrals N=660	No Show/Canceled N=330 (50.0%)	Completed N=330 (50.0%)	p-value
Patient Characteristics				
Age, %				
16-39y	310 (47.0)	164 (49.7)	146 (44.2)	0.33
40-64y	309 (46.8)	145 (43.9)	164 (49.7)	
≥65 y	41 (6.2)	21 (6.4)	20 (6.1)	
Female, %	216 (32.7)	103 (31.2)	113 (34.2)	0.41
Race, %				
White/Caucasian/Non-Hispanic	271 (41.1)	151 (45.8)	120 (36.4)	0.002*
Black/Non-Hispanic	199 (30.2)	86 (26.1)	113 (34.2)	
Hispanic/Latino	84 (12.7)	37 (11.2)	47 (14.2)	
Asian/Pacific Islander	54 (8.2)	21 (6.4)	33 (10.0)	
Other/Unknown	52 (7.9)	35 (10.6)	17 (5.2)	
Non-English Language, %	139 (21.1)	44 (13.3)	95 (28.8)	<0.001*
≥2 Comorbidities,^ %	135 (20.5)	81 (24.6)	54 (16.4)	0.009*
Chronic pain, %	104 (15.8)	47 (14.2)	57 (17.3)	0.29
Primary Payer, %				
Private	73 (11.1)	45 (13.6)	28 (8.5)	0.005*
Medicare	58 (8.8)	35 (10.6)	23 (7.0)	
Medicaid	218 (33.0)	117 (35.5)	101 (30.6)	
Uninsured	263 (39.9)	115 (34.9)	148 (44.9)	
Other*	48 (7.3)	18 (5.5)	30 (9.1)	
ED Visits in prior year, No., mean(SD)	2.2 (5.3)	3.1 (6.8)	1.3 (3.0)	<0.001*
Married, %	159 (24.1)	70 (21.2)	89 (27.0)	0.08
Homeless, %	135 (20.5)	96 (29.1)	39 (11.8)	<0.001*
Psychiatric diagnosis, %	79 (12.0)	46 (13.9)	33 (10.0)	0.12
Substance use, %	235 (35.6)	148 (44.9)	87 (26.4)	<0.001*

^Number of Elixhauser comorbidities; *Other payers include L&I, auto insurance claims

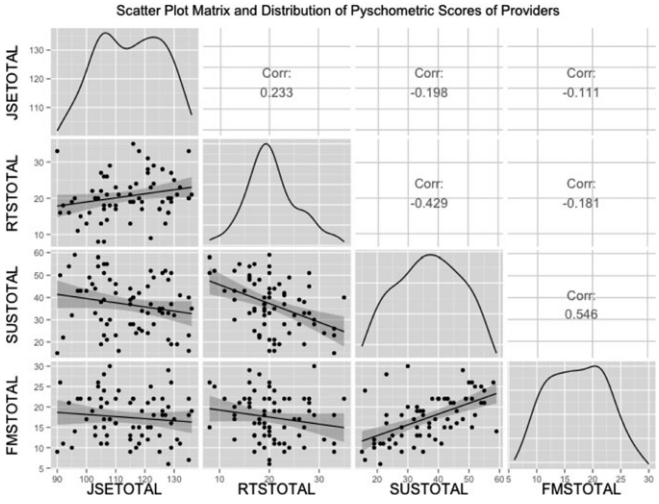

Figure 312 – Melnick

Table. Stepwise linear regression model to predict risk-adjusted CT utilization rate by provider

	Odds Ratio	95% Confidence lower limit	95% Confidence upper limit	p-value
Physician Gender (male)	0.977	0.857	1.113	0.724
Physician Ethnicity (not Hispanic or Latino)	0.97	0.72	1.305	0.839
Year Practicing	0.995	0.987	1.003	0.199
JSE	0.996	0.992	1.001	0.163
RTS	0.99	0.978	1.002	0.105
FMS	1.001	0.989	1.013	0.859
SUS	1.001	0.994	1.008	0.786

distributions, relationships between the psychometrics, and their correlation coefficients are provided (Figure). There were no associations found between performance on the psychometric scales and CT utilization (Table).

Conclusion: EP empathy had a bimodal distribution. Performance on the JSE, RTS, SUS or FMS were not predictive of CT utilization in the ED.

313 Physicians' Motivations for Using Shared Decision-Making in the Emergency Department: An Exploratory Qualitative Analysis

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Background: Shared decision-making (SDM) is increasingly recognized as an important facet of patient-centered care and a possible approach to improving resource utilization. Despite growing interest in SDM in the ED, little is known about emergency physicians' (EP) motivation to use SDM. Understanding current patterns of SDM use in the ED and the rationale for using it is essential for the development of interventions to increase use.

Table. Key Motivators/Barriers identified by emergency medicine physicians through semi-structured qualitative interviews.

Theme	Motivator/Benefit	Barrier/Downside
Attitudes Towards SDM	Recognition of benefits to patient Ethical choice Benefit to physician Physician wishes to avoid low-yield tests/treatments that may harm/confuse	No perceived benefit to physician for decreasing resource utilization
Culture	Culture of medicine changing away from paternalism	Culture of medicine/American culture is perceived to be intolerant of uncertainty
Patient Characteristics	Patient has follow-up Patient asks about alternatives Patient is engaged/engagable	Lack of capacity/competency Lack of desire for involvement Low health literacy/education Language/cultural barriers
Clinician Skills	Most physicians feel comfortable engaging patients in SDM	All physicians admit they have never had any formal training in SDM
Relationship to Risk	SDM may allow for sharing of risk and *decrease* liability	SDM may *increase* liability in that physician may "do less" and miss something

Objectives: To identify and explore factors that may motivate EPs to engage in SDM.

Methods: In this qualitative study, informed by the Theory of Planned Behavior and Social Cognitive Theory, we conducted semi-structured interviews with a purposeful sample of EPs. Interviews were recorded and transcribed verbatim. Using a directed qualitative content analysis approach, 3 members of the research team performed open coding of the transcripts in an iterative process, building a provisional code book as coding progressed. Respondent validation was employed to ensure methodological rigor.

Results: Fifteen EPs, ages 31-65, from 10 practice settings were interviewed. Several had not heard of the phrase "shared decision-making," but all felt they used SDM techniques to some degree. Most noted they used SDM to counteract an algorithmic or defensive approach to diagnosis and treatment, using SDM when their clinical acumen suggested "this is not a path we want to go down…but the medico-legal side says we should." All participants believed patients benefited from SDM in terms of satisfaction, engagement, or education, and several noted professional benefits in terms of personal satisfaction, increased comfort from sharing of uncertainty, and possible medico-legal protection. Key barriers to SDM included time, certain patient characteristics, and a general culture of intolerance of uncertainty. Nearly all participants identified research outcomes that they felt would encourage their use of SDM (e.g. improvements in patient satisfaction, mitigation of risk) and many prioritized patient-centered outcomes over systems outcomes such as improved resource utilization.

Conclusion: Despite perceived barriers to SDM, EPs identified many benefits and motivating factors. While future SDM interventions should address potential barriers, capitalizing on motivating factors may improve uptake of SDM in the ED.

314 Perceptions of Emergency Care by Sexual and Gender Minorities in Colorado: Assessing Barriers, Quality, and Factors Affecting Identity Disclosure

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Background: While there are numerous healthcare disparities documented for sexual minorities (lesbian, gay, bisexual, queer) and gender minorities (transgender, gender variant) (collectively "LGBT"), there is scant published data on this group's experience with emergency care.

Objectives: To characterize barriers to and quality of emergency care for the LGBT community.

Methods: A survey was deployed through a state-wide LGBT advocacy organization's email, representing a convenience sample of sexual and gender minorities. Statistical analysis utilized chi squared and Fisher's exact when appropriate.

Results: Of 462 respondents reporting sexual orientation and gender identity, 71% were sexual minorities and 19% were both gender and sexual minorities. Rates of lifetime emergency department (ED) avoidance were similar between sexual minorities (18%) and heterosexual cisgender respondents (14%), but significantly higher in gender minorities (49%) ($p < 0.001$). Care avoidance was associated with income and insurance type ($p < 0.05$), but not race or ethnicity. Rates of ever avoiding the ED due to a fear of discrimination were significantly higher in gender minorities (21%) compared to sexual minorities (3%) ($p < 0.001$). Of those who ever avoided the ED, half did so for financial reasons, regardless of sexual orientation or gender identity. Half of minority respondents who reported ever avoiding the ED identified a negative prior ED experience as a reason for avoiding care. Twelve percent of minority respondents reported feeling their most recent ED visit was negatively affected because they were LGBT, with 46% feeling treated differently and 40% hearing homophobic language. Negative experiences were more common in gender minorities (34%) than sexual minorities (6%) ($p < 0.001$). While 41% of respondents disclosed their LGBT identity in the emergency department, 43% noted non-inclusive intake forms that made them feel less comfortable disclosing their identity. Similarly, a lack of LGBT signage was frequently noted (40%) as negatively impacting identity disclosure.

Conclusion: Gender minorities report increased rates of ED avoidance and negative experiences in emergency departments compared to sexual minorities. Further work should characterize the nature of these experiences.

315 Don't Go Yet: An Analysis of Patients Who Leave Against Medical Advice Across Emergency Departments in the United States

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Background: Patients who leave against medical advice (AMA) from the emergency department represent a significant risk from both the health outcomes, and medico-legal perspectives. This phenomenon denotes a gap in care, as neither the goals of the patient, nor the provider have been adequately met. Despite its importance, there are a paucity of studies which characterize patients who leave AMA from the emergency department, and none which seek to identify predictors.

Objectives: To describe the epidemiology of, and identify predictors for leaving against medical advice among emergency department patients in the U.S.

Methods: This is a retrospective cross-sectional, secondary analysis of the National Hospital Ambulatory Medical Care Survey (NHAMCS) for the years 2009 and 2010. The population included patients who visited the emergency department for any reason. The primary outcome was discharge from the ED AMA. Descriptive statistics were used to characterize the population, and multivariable logistic regression was performed to identify variables associated with leaving the ED AMA.

Results: There were 319 records in NHAMCS of patients who left the ED AMA, corresponding to an estimated 1,179,557 visits, and 0.75% of the total population. Among these, the mean age was 40.8 years (95%CI 37.8, 43.8), and the greatest proportion were female (50.1%, 95%CI 43.4, 58.5) and of non-Hispanic, white race/ethnicity (61.3%, 95%CI 52.4, 69.5) (See Nelp Table 1). Multivariable logistic regression identified the following as being independently associated with leaving the ED AMA (odds ratio): white, non-Hispanic (2.01) and black, non-Hispanic (2.53), compared with Hispanic, non-private insurance as expected source of payment (1.95), ESI level 2, compared with ESI level 5 (3.25), and ED visit within the last 72 hours (2.11) (See Nelp Table 2).

Nelp Table 2: Multivariable Logistic Model of Discharge AMA

	Odds Ratio	95% CI
AGE	1.00	0.99 – 1.01
RACE/ETHNICITY		
Hispanic	reference	-
White, Non-Hispanic*	2.01	1.22 – 3.32
Black, Non-Hispanic*	2.53	1.47– 4.36
Other, Non-Hispanic	1.66	0.56 – 4.87
EXPECTED PAYMENT		
Private insurance	reference	-
Non-private insurance*	1.95	1.41 – 2.69
ARRIVAL BY EMS	1.08	0.75 – 1.55
ESI LEVEL		
Level 5	reference	-
Level 4	1.65	0.59 – 4.57
Level 3	2.52	0.85 – 5.97
Level 2*	3.25	1.22 – 8.69
Level 1	2.93	0.84 – 10.22
SEEN IN LAST 72 HRS*	2.11	1.27 – 3.50

*p<0.05

Conclusion: Only a small fraction of ED patients leave AMA overall. Factors which increase the odds of leaving AMA include white and black non-Hispanic race/ethnicity, non-private insurance status, ESI level 2 triage category, and an ED visit within the last 72 hours.

316 ED Utilization 3-Days Prior to a Fall-Related ED Visit Among Elderly Patients

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Background: Emergency Department (ED) visits for falls among the elderly are common in the United States. As the population ages this number will continue to escalate. The purpose of this study was to study is to identify and describe ED visits 3 days prior to a fall-related visit.

Objectives: The objective of this study was to study is to identify and describe ED visits 3 days prior to a fall-related visit.

Methods: A multi-center retrospective longitudinal cohort study of ED visits from all 325 licensed non-military acute care hospitals in California in 2013 using non-public data. Visits without a valid patient identifier and patients under the age of 65 years or who expired were excluded. Fall-related index visits were identified using external cause-of-injury codes (E-codes 880-888). The primary outcome was ED utilization excluding admits/transfers within 3 days prior to a fall-related ED visit. Logistic regression was used to assess independent associations between demographic characteristics, payer, co-morbidity, and having a psychiatric or substance abuse diagnosis between those who had prior utilization and those who did not.

Results: A total 12,717,896 ED visits were included in the study period, of which 205,777 patients met inclusion and exclusion criteria resulting in 242,648 index ED visits. A total of 7,229 (3.5%) of patients had at least one 3-day visit prior to their index visit for a total of 7,735 visits. A total of 2,062 (26.7%) of index visits were different than the discharging facility and 1,650 (21.3%) had the same clinical classification software diagnosis grouping. At the 3-day prior visit, 3,669 (47.4%) of patients had a fall documented, 3,449 (44.6%) were identified as having at least 1 comorbidity, 1,784 (23.1%) had a mental health related diagnosis, and 583 (7.5%) had a substance abuse-related diagnosis.

Having a psychiatric and substance abuse diagnosis had the strongest independent associations with having an ED visit 3 days prior to the index visit (OR 1.45, 95% CI =1.38 - 1.53 and OR 1.37, 95% CI = 1.26 - 1.48, respectively).

Conclusion: In this multicenter study in 325 hospitals in California, a relatively high percentage of patients were seen in an ED within 3 days of a fall-related ED visit. There may be potential for additional ED-based interventions to decrease the occurrence of these events.

317 Simulation Cases are Less Stressful Only When Both Easy and Familiar

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Background: Simulation has been used with increasing frequency in medical education. Yet there is scant research on predictors of stress from simulation cases in resident education.

Objectives: We examine how familiarity with a clinical scenario and perceived difficulty affect stressfulness.

Methods: Residents from a 3-year emergency medicine residency participated in the simulation curriculum. Following each case, a visual analog scale (VAS) questionnaire was completed. For a case's difficulty or familiarity, the VAS was divided at midline into either "Difficult" or "Easy," and either "Familiar" or "Unfamiliar." This created four groups: *Difficult/Unfamiliar*, *Difficult/Familiar*, *Easy/Unfamiliar*, and *Easy/Familiar*. The VAS score for self-reported stress was measured and converted to a 0-to-100 scale. Unpaired two tail t-tests were used for comparisons of the stress between the four groups, with a Bonferonni-corrected *p* value of 0.0083 for significance.

Results: A total of 60 residents provided 240 responses on 17 simulation cases. The response rate was 96%, with 11 non-responders. A total of 87 cases were *Difficult/Unfamiliar*. These cases had a stress score of 66 (SD 19). In 81 *Difficult/Familiar* cases, the stress score was 66 (SD 19). In 38 *Easy/Unfamiliar* cases, the stress score was 64 (SD 23). In 35 *Easy/Familiar* cases, the stress score was 49 (SD 22). *Easy/Familiar* cases were significantly less stressful than *Difficult/Unfamiliar* ($p<0.0001$), *Difficult/Familiar* ($p<0.0001$), or *Easy/Familiar* ($p=0.0045$). However, there was no difference between *Difficult/Unfamiliar*, *Difficult/Familiar* and *Easy/Unfamiliar* cases (*p* values from 0.5956-0.9990).

Conclusion: Compared with simulation cases that are both difficult and unfamiliar, cases that are easy but unfamiliar are not less stressful. Similarly, familiarity with a difficult scenario does not mitigate stress. Only when residents report a case as both easy ***and*** familiar is stress significantly reduced. Given a belief that stress can negatively affect cognitive performance, these results can anticipate cases that may be problematic for residents. Notably, simply designing "easy" cases does not confer less stress in rare or unfamiliar scenarios. Anticipating simulation cases associated with higher stress may allow educators to address or mitigate the stress so that it does not impede learning.

318 Simulation Training for the Management of Shoulder Dystocia

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Background: Emergency medicine residents rotate through OB services, yet, shoulder dystocia occurs infrequently (0.5-1.5% of deliveries) raising the possibility that they won't encounter it prior to graduation. The literature describes use of mannequin simulators to train for shoulder dystocia in the OB setting. However, there is a paucity of data evaluating this training method for non-OB personnel.

Objectives: We hypothesized that non-OB personnel would show improvement in shoulder dystocia management for simulated newborn delivery after a structured training program.

Methods: Before and after interventional trial involving volunteer health personnel and college students with no prior OB training. Simulations performed using a Noelle robotic birth simulator. Subjects watched a video that familiarized them to normal delivery. Subjects then individually tested under simulated conditions to successfully deliver an infant with shoulder dystocia. Successful delivery not considered to have occurred unless subject performed all basic maneuvers (1-point per: McRobert's, suprapubic pressure, gently downward pressure, corkscrew maneuver/delivery of the posterior shoulder, consult OB/NICU team). Study author then performed intervention detailing shoulder dystocia/ proper management followed by video. Subjects returned > 3 months, given a similar simulation, and same scoring system was utilized. Categorical data presented as frequency of occurrence, analyzed by chi-square. Continuous data reported as means +/- SD, analyzed by paired t-tests. Tests two-tailed; alpha=0.05.

Results: 12 volunteers in study group (9 nurses, 2 college students, 1 EMT); mean age 33+/-6. The mean subject score in the initial encounter was 1.8+/-1.2. The mean score after intervention analysis for those completing the study was 5.7+/-0.5 with 8 out of 12 (66.7%) completing all 6 maneuvers. There was a significant difference in mean scores before and after the intervention (3.92; $p<0.001$). Participants provided a mean rating for the utility of the training 3.6+/-0.5 on a 4-point likert scale (4=strongly agree).

Conclusion: Volunteers without prior OB training who received onsite and video training showed significant improvement in management scores post-intervention in a simulated shoulder dystocia delivery.

319 Emergency Physician Preferences for Antihypertensive Agents in a High Fidelity Simulation of Hypertensive Neurological Emergencies

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Background: Severely elevated blood pressure (BP) worsens long-term neurological outcomes in acute hemorrhagic and ischemic strokes. Despite the recent publication of several randomized trials comparing BP targets, and incorporations of these data into professional society guidelines, no clear directives exist regarding choice of intravenous (IV) antihypertensive agent.

Objectives: To explore emergency physician (EP) preferences for different antihypertensives in simulated patients with hemorrhagic and ischemic strokes.

Methods: Volunteer EPs were recruited during the 2015 American College of Emergency Physicians Research Forum. Volunteers were blinded to the study outcome. Participants were randomized to a high fidelity, live actor simulation of either acute ischemic or hemorrhagic stroke. A nurse narrator provided additional data including vital signs, CT of the brain, ECG, and lab results. The decision to treat or not-treat the patient's elevated BP and drug choice, were recorded at two critical branch points. Descriptive statistics were compiled and Chi square

Agent	Pre-CT (%)	Post-CT (%)		
		Ischemic Stroke	Hemorrhagic Stroke	Total Stroke
Labetalol	61.5	28.6	14.3	19.6
Clevidipine	5.1	9.5	2.9	5.4
Nicardipine	23.1	38.1	74.3	60.1
Nitroprusside	2.6	4.8	2.9	3.6
Hydralazine	5.1	0	2.9	1.8
Metoprolol	2.6	19.0	0.0	7.1
Other	0	0.0	2.9	1.8
Total	100	100	100	100

Table 319: Stiebel.

analysis of associations between the choice of antihypertensive agent and stroke type was performed.

Results: Eighty-six EPs participated in the simulation. The participants were largely attending physicians (69%), male (76%), and worked in academic centers (83%). The median number of ischemic and hemorrhagic strokes treated per year were 39.8 (SD = 27.9) and 25.6 (SD 23.5), respectively. The majority of EPs (n=63, 73%) treated BP as recommended in clinical guidelines. Nicardipine and labetalol were the most commonly used agents throughout the simulation scenarios, with a preference towards the use of beta blockers (BBs) pre-CT, and calcium channel blockers (CCBs) later (Table). CCBs were preferentially chosen in hemorrhagic (77%) vs. ischemic stroke (47%), $p = 0.039$.

Conclusion: In this simulation study, EP choice of IV antihypertensive agent was significantly associated with stroke type, with a preference towards using CCBs in hemorrhagic stroke. The preferred medication pre - CT was labetalol, which may relate to greater ease of bolus, rather than continuous administration. The variability in drug choice reflects the current inconsistencies in trial evidence for these conditions.

320 Presence of a Legally Authorized Representative in a Pre-Hospital Observational Study of Patients Undergoing Chemical Sedation for Agitation

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Background: Agitation in the prehospital environment is a common problem that represents a safety issue for both the patient and caregiver. The ability to study the management of these patients is challenging, in part due to the inability to obtain adequate informed consent directly from the agitated patient.

Objectives: We sought to determine the presence of legally authorized representatives (LAR) who might provide surrogate consent in a pre-hospital study of subjects undergoing sedation for severe agitation (SA). This is part of a larger study examining two pre-hospital medications for chemical sedation.

Methods: This was a prospective observational waiver of consent study (45 CFR 46.116) of subjects with SA requiring chemical restraint. In 6 month blocks, subjects received either haloperidol or ketamine per protocol for SA. Paramedics (PMs) were trained in the Altered Mental Status (AMS) Scale, a validated scale of agitation. Adults were included if they were classified as SA as determined by scoring 2 or 3 on the scale and required sedation as determined by the PM. PMs measured time to adequate sedation and also recorded presence of an identifiable LAR at the scene. An LAR was defined as an appointed health care surrogate, judicially appointed guardian, or closest adult relative in the absence of the former.

Results: 155 subjects were enrolled. Eight subjects were excluded for analysis. The presence of an LAR was not recorded in 17 cases, leaving 130. Most subjects, 122/130 (94%) did not have an LAR identifiable by PMs at the scene. The median age of all those enrolled was 33 (18-69), and 82/147 were male (56%). Of 147 subjects, 36 had a history of psychiatric illness alone (24%), and 21 (14%) had a history of chemical dependency alone, with 68 (46%) having both. Breath or serum alcohol data was available for 113 subjects, 74 (65%) of which had a level of 0.08 or higher.

Conclusion: The majority of subjects did not have a LAR present at the scene. Most subjects had psychiatric and chemical dependency problems, making a meaningful consent process unlikely. Our findings suggest that the presence of an LAR for SA patients cannot be counted on to allow prospective surrogate consent in the prehospital setting. In such circumstances, waiver of informed consent or exception from informed consent should be considered.

321 Outcome of an Intervention on Compliance with Recommended Breast and Cervical Cancer Screenings Among Patients and Their Visitors in the Emergency Department Utilizing Research Associates

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Background: A significant literature has shown the utility of routine screening for breast and cervical cancer prevention and treatment. Despite the benefits of screening, a large proportion of the adult female population remains non-compliant with cancer screening recommendations.

Objectives: The current study sought to investigate the outcome of using research associates in the emergency department (ED) to assess prior compliance with breast and cervical cancer screening (BCCS) and provide information on obtaining overdue screening.

Methods: A prospective, interventional study was performed where research associates at five hospitals approached as many non-emergent female patients and their female visitors as possible between the ages of 21 and 74. After obtaining consent, the participant's compliance with US Preventive Services Task Force recommendations for BCCS was assessed. Those participants determined to be overdue for these screening were provided information on how to accomplish these screenings.

Results: 12,858 participants were enrolled in the study. A total of 5,390 participants were between 50-74 years old and required breast cancer screening, with 695 participants (13%) reporting they were overdue for a mammogram. 11,605 participants were 21-65 years old, with 1124 participants (10%) determined to be overdue for Pap tests. Compliance rates were greatest among higher educated and insured individuals. 811 participants consented for a follow-up call, with 571 overdue for a Pap test and 364 overdue for a mammogram. Follow-up contact was made with 108 participants overdue for Pap tests (19%) and 73 overdue for mammogram (20%). Of those able to be contacted, 26% had Pap tests done or scheduled and 11% had mammograms done or scheduled. The most frequent reasons given for not scheduling screening were lack of time (40%), financial concerns (14%), and forgetfulness (10%).

Conclusion: Our results indicate that RAs can identify large numbers of women in need of BCCS screening. However, low follow-up rates, both in terms of the ability to contact participants and their interest in scheduling screenings, limit the strength of conclusions that can be drawn with regard to public health impact. Follow-up work is utilizing alternative methods for ensuring contact and encouraging screening.

322 Do Emergency Department Providers Omit Pertinent Patient Information During Verbal Handoffs?

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Background: Numerous studies have shown that patient handoff between providers is a significant source of medical error that negatively impacts patient outcomes. The ED is uniquely vulnerable to handoff error given its high patient-to-provider ratios, shift work resulting in multiple handoffs, and rapid decision-making despite diagnostic uncertainty. Few studies have identified specific problem areas during handoff between ED providers.

Objectives: To determine if pertinent information is omitted during handoffs between ED resident physicians, identify the types of information omitted, and compare omission by training level.

Methods: A group of trained independent observers used a standardized collection tool to record the objective conveyance of patient information during handoffs between ED resident physicians at an urban hospital with a PGY1-4 program. All patients age 18-65 years old and triaged as ESI level 3-5 were included. The following informational elements were recorded for each provider: Patient Identifiers, ED Course, Chief Complaint, Diagnosis, Pending Tasks, and Disposition Status. Physicians were blinded to the objectives and outcome measures of the study. The Fisher Exact Test was used to compare subgroups. All p-values were computed using the R statistical package.

Results: A total of 103 random patient handoffs were observed over a two-month period. Of these, 76% included Patient Identifiers; 53% Chief Complaint; 83% ED Course; 57% Diagnosis; 70% Pending Tasks; and 24% Disposition Status. PGY4 providers omitted Patient Identifiers, Chief Complaint, and ED Course more frequently when compared with PGY1-3 providers (61% vs 90%, p<0.001; 69% vs 37%, p<0.001; 96% vs 69%, p<0.001).

Conclusion: Of all the informational elements observed during provider handoff, Disposition Status was most likely to be omitted at any training level, followed by Diagnosis (including mention of unknown disposition or diagnostic uncertainty). PGY1-3 providers tended to focus more on information gathering (stating identifiers and events) rather than information synthesis (conveying clinical assessment and disposition plan) during verbal handoffs. Future educational interventions to improve provider handoffs should be targeted toward these elements based on training level.

323 Evaluation of a Midstream Urine Collection Technique for Infants in the Emergency Department

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Background: A novel bladder stimulation technique has been described for midstream urine (MSU) collection in well-feeding, inpatient newborns. Success of this technique for infants presenting to the Emergency Department (ED) is unclear.

Objectives: To examine the performance characteristics of a bladder stimulation technique for MSU collection amongst infants presenting to the ED.

Methods: Our prospective ED-based cohort study enrolled a convenience sample of infants aged ≤ 90 days who required urine testing. Infants with significant feeding issues, moderate/severe dehydration or critical illness were excluded. Bladder stimulation consisted of finger tapping on the lower abdomen with or without lower back massage while holding the child upright. Healthcare providers (HCPs) received standardized training in the technique. Primary outcome was the proportion of infants with successful MSU collection via the technique. Success was defined as adequate sample collection (≥ 1 mL) within 5 minutes of initiating stimulation. Secondary outcomes included the proportion of contaminated MSU samples, time required for MSU collection, patient discomfort on a 100 mm visual analog scale [VAS], and parental/HCP satisfaction. Assuming success *a priori* in 50% of infants, a sample size of 115 allowed a 95% confidence interval of +/- 9.1% around the point estimate.

Results: We enrolled 115 infants. Mean age was 53.0 days (IQR 26.7-68.0); 58.3% were male (69.2% uncircumcised). MSU collection was successful in 61 infants (53.0%; 95% CI 0.44, 0.62). Thirty one MSU samples (50.8%) were contaminated; uncircumcised males held the highest proportion (55.0%). Most contaminated samples (83.9%) were reported as "non-significant growth" or "growth of ≥ 3 organisms" and easily identifiable as contaminants with minimal impact on clinical care. Only 4 (8.5%) of 47 infants discharged after successful MSU collection had a repeat ED visit for urine testing. Median stimulation time for MSU collection was 45 seconds (IQR 20-99 secs). Mean VAS for infant discomfort was 20.2 mm (SD +/- 20.4 mm). Most parents (90.1%) and HCPs (86.5%) rated their experience as positive.

Conclusion: The success rate of the bladder stimulation technique was significantly lower than previously reported. The contamination rate was high but most contaminated specimens were easily identifiable as such and had minimal clinical impact.

324 Knowledge, Attitudes and Barriers Regarding Provision of Preventive Contraception in a Pediatric Emergency Department

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Background: Despite recent decreases in the rate of unintended adolescent pregnancy, barriers to access and use of preventive contraception (PC) remain. The potential provision of PC to adolescents in a pediatric emergency department (PED) has not been rigorously investigated.

Objectives: 1)To determine contraception knowledge of health care providers (HCP), caregivers and patients and 2) to identify attitudes and barriers regarding provision of PC during visits to a PED.

Methods: This mixed methods study examined knowledge and attitudes towards the provision of PC for female adolescents presenting to the PED among 3 key stakeholder groups: 1) female patients ages 12-18; 2) female caregivers and 3) HCP (physicians, advance practice providers, nurses) recruited from an urban, tertiary care children's hospital. Participants completed a demographic survey and Contraception Knowledge Inventory. Semi-structured group interviews were performed, audio recorded, transcribed and analyzed using thematic content analysis. Descriptive statistics and chi square tests were used.

Results: 173 participants were enrolled: 72 patients, 70 caregivers and 31 HCP. 61% patients were African American; median age 15 (range 12-18). 56% caregivers were African American; median age 41 (range 29-68). Overall knowledge was significantly different: 3% patients, 36% caregivers and 94% HCP answered more than half of the knowledge questions correctly ($p<0.001$). A subset (11 patients, 13 caregivers, 31 HCP) participated in semi-structured group interviews. Support for PED provision of PC held across all 3 groups. Within group analysis demonstrated differences. Patients emerged as most supportive but identified barriers related to confidentiality. Caregivers identified concerns over contraception being provided without their knowledge. HCP identified decreased ED efficiency, provider's perceived lack of knowledge and absence of consistent patient follow-up as concerns.

Conclusion: The PED is increasingly used by adolescents for preventive health care needs. This study illustrates the knowledge gap among adolescents regarding PC and supports the idea that with careful consideration of key stakeholder concerns, the PED has the potential to serve as an additional venue for PC provision and counseling for adolescent females.

325 Changes in Opioid Prescribing Patterns in the Pediatric Emergency Department After the 2014 Food and Drug Administration Rescheduling

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Background: In an effort to decrease hydrocodone abuse, in October of 2014 the Food and Drug Administration (FDA) changed hydrocodone-containing products (HCPs) from schedule-III to schedule-II status. Currently, codeine-containing products (CCPs), in which genetic variations for drug-metabolizing enzymes alter their efficacy and toxicity, are the only non-schedule II oral opioid analgesics. The potential consequences of this rescheduling in the children have not been described.

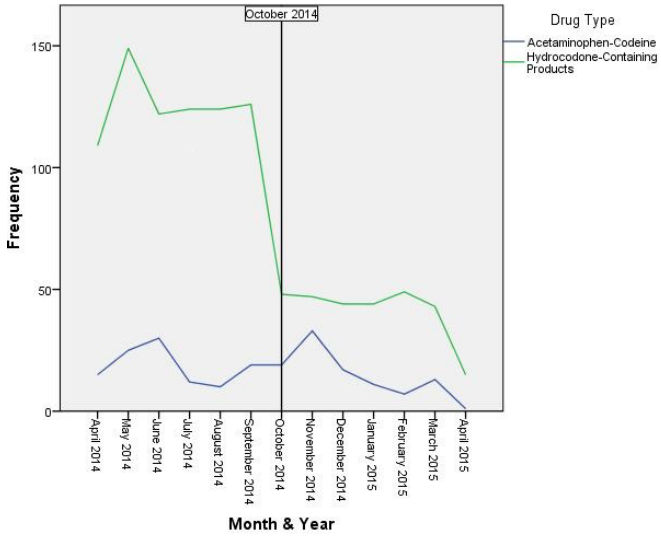

Figure 325 – Chumpitazi

Objectives: To elucidate the impact of the reclassification of oral opioid analgesics after the FDA rescheduling of HCPs in the pediatric emergency department (ED). We hypothesized a decline in HCP prescriptions and an increase in CCP prescriptions after the FDA scheduling change among children discharged from the ED.

Methods: We performed a retrospective cohort study utilizing data extracted from the electronic medical record for prescribing patterns for 6 months before and after the FDA rescheduling of HCPs. Patients were eligible for inclusion if they were prescribed an oral opioid-containing analgesic at discharge.

Results: There were 1,292 patients with prescriptions for oral opioid-containing medications written at the time of discharge from the ED during the study period. The unadjusted odds of the prescription of HCPs were reduced by 60% after the FDA rescheduling of HCPs with no significant increase in the odds of prescribing CCPs (Odds Ratio 0.40 [0.34-0.54], p<0.001).

Conclusion: The rescheduling of HCPs resulted in a reduction in HCP prescriptions without increase in the prescription of CCPs. This is concerning for under treatment of pain.

326 Trends in Naloxone Use in Pediatric Patients

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Background: Death from opiate overdose poses a large societal burden. Naloxone is a safe opiate reversal agent. The CDC reported significant increased heroin overdose deaths across 28 states between 2010 and 2012. Similar opiate abuse trends have been seen the pediatric population. It is unclear if the described increase in opiate use among pediatrics has led to an increase in the use of naloxone among pre-hospital providers for pediatric patients.

Objectives: We describe pre-hospital naloxone utilization among pediatric patients in a large urban EMS system.

Methods: This is a retrospective cohort study. We collected data from a pre-hospital database from an urban EMS system. Children less than 18 years old receiving naloxone in the pre-hospital setting between 2010 and 2014 were included. A chart review of the individuals included in the study was performed. Basic demographic data was collected including age, race, indication, route of delivery and medication effect. We describe the number of cases per year as well as the median age of the patients.

Results: Thirty-six children out of 36,346 pediatric encounters received naloxone. By comparison, total annual naloxone use from 2012 to 2014 nearly doubled, with 1,063 doses administered in 2014. The median age of all pediatric patients receiving naloxone is 16 (IQR 11-17). Twenty-five (69.4%) of the patients were between the ages of 14 and 17 with 15 (44.4%) of those being 17 years olds. The number of naloxone use ranged from 5-9 patients annually over the 5 years of the study. Indication, route and outcome was missing in 12 records. Of the remaining 24 patients, the two most common indications were pinpoint pupils (54%) and depressed respirations (33%). Intravenous Naloxone was given in all but one patient. Most patients (71%) had clinical improvement after delivery of Naloxone.

Conclusion: Pre-hospital use of naloxone in the pediatric population remains uncommon. There is not increased naloxone use among pediatric patients as has been described in the adult literature. Most naloxone use in the study population occurred in those individuals between 14 and 17 years old.

327 The Effect of a Dedicated Psychiatry Team on Pediatric Emergency Mental Health Care

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Background: Pediatric emergency department (PED) visits among children and adolescents with acute mental health needs has increased over the past decade, without a proportionate growth in outpatient resources. Studies have shown that there are limited therapeutic interventions provided during these PED stays.

Objectives: The objective of this study was to evaluate the effect of a new pediatric mental health liaison program with a dedicated PED psychiatric team. It is our hypothesis that this model reduces length of stay.

Methods:: This was a before and after retrospective cohort study comparing the year prior to (06/2012-06/2013) and the year after (10/2013-10/2014) implementation of a new PED psychiatric team. All patients aged 1-18 with a mental health diagnosis were included. Patients who did not receive a psychiatry consult in the PED were excluded. Data collected included demographics, LOS, restraint use, diagnosis, and final disposition. The two time periods were compared by LOS, restraint use, and final disposition. Regression analysis controlled for patient demographics, insurance type, suicidality, and past mental health history. (LOS) and reduces hospitalization rates among pediatric patients with mental health needs.

Results: There were 83 encounters in the year prior to and 129 encounters in the year after the implementation of the liaison program. The patient demographics were similar between the two time periods including age, means of arrival, insurance type and past mental health history. There was an increase in the proportion of patients with suicidal ideation from 47% to 57% and suicide attempts from 25% to 44% in the year prior to and the year after respectively. There was a statistically significant decrease in mean PED LOS from 44.4 hours to 34.4 hours (p=0.05). In addition there was a statistically significant decrease in the admission rate to an inpatient psychiatric facility as compared to patients in the year prior to the program from 42.9% to 24.6% (p<0.01). There was no increase in repeat visits during the 1 year post-intervention period.

Conclusion: The use of a dedicated child psychiatrist and mental health social worker to the PED results in significantly decreased LOS and need for admission without any change in return visit rate. Larger studies and cost effectiveness analysis are needed to confirm these findings from our center.

328 Do Pediatric Patients with High Anxiety Have Behavioral Changes After ED Procedural Sedation?

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Background: Negative at-home outcomes experienced after Emergency Department (ED) sedation have not been prospectively evaluated. For surgical patients, preoperative anxiety is associated with negative postoperative behavior changes including sleep anxiety, separation anxiety, aggression toward authority and apathy/withdrawal. No study has evaluated the association between anxiety and negative post-discharge behaviors for children sedated in the ED.

Objectives: The purpose of this study was to determine the proportion of children experiencing high anxiety and negative post-discharge behaviors. Factors associated with negative behaviors 1 week after ED sedation were determined.

Methods: This is a prospective cohort study of children receiving intravenous ketamine sedation for fracture reduction. Children's anxiety prior to sedation was observed using the Modified Yale Preoperative Anxiety Scale (range 23-100; ≥ 40 indicates high anxiety). Negative behavioral change was reported by parents using the Post-Hospitalization Behavior Questionnaire 1-2 weeks after discharge; significant negative behavior change was defined as ≥7 changes consistent with prior literature. Descriptive statistics and relative risks were calculated.

Results: 99 eligible patients were enrolled, 82 (83%) completed follow-up; median age was 7 years (range 2-16), 72% were male, 73% white and 21% African American. Median sedation duration was 39 minutes (range 15-140). Median anxiety score was 37 (range 23-97); 40% had high anxiety. Overall, 22% of children had significant negative behavior changes after sedation. The most frequent negative behavior changes were separation anxiety and apathy/withdrawal. Factors associated with negative behaviors were high anxiety (RR=3.9, 95% CI 1.5-9.8) and black race (RR= 3.0, 95% CI 1.3-7.2) but not age, gender, ethnicity, presence of other medical conditions or sedation duration.

Conclusion: 40% of children undergoing sedation were highly anxious. Overall, 22% of children were reported to have significant negative behaviors after discharge. Highly anxious and African American children have increased risk of negative behavioral changes which have not been previously recognized in the ED setting.

329 Emergency Department Overcrowding: Exploring the Attempts to Avoid Presentation

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Background: Some low-acuity Emergency Department (ED) presentations are considered convenience visits and potentially avoidable with improved access to primary care and other services.

Objectives: This study explored patients' efforts to avoid ED presentation and the types of alternative care sought prior to ED presentation.

Methods: Ambulatory patients aged 17 years and older were randomly selected from electronic registration records at three urban EDs in Edmonton, Alberta, Canada. Following initial triage, stabilization, and verbal informed consent, patients completed a 47-item questionnaire. Survey data were cross-referenced to a minimal patient dataset consisting of ED and demographic information. The questionnaire collected information on demographics, primary care visit history, actions taken in an attempt to avoid ED presentation, and reasons for ED presentation.

Results: Of the 2144 eligible patients, 1408 (65.7%) surveys were returned and 1402 (65.4%) were complete. The majority of patients (60.1%) attempted seeking at least one form of alternative health care treatment or advice prior to ED presentation. Patients took some of the following actions: 54.1% visited a physician and 21.0% visited an alternative health care professional (e.g., chiropractor, physiotherapist, etc.). Telephone contact also occurred with physicians' offices (47.3%) or the regional health information line (13.5%). Few patients used Alberta's ED wait times website, and there was a significant variation among sites. Once at the ED, most patients (91.4%) believed that the ED was their best care option.

Conclusion: Most ambulatory patients attempted to avoid an ED visit by seeking alternative sources of care. While patients most frequently sought the care of a physician, a wide variety of alternatives were also attempted. Despite this attempted access to alternative care, once patients presented to the ED, the majority perceived the ED as their best care option.

330 Understanding of the Affordable Care Act by Hispanic vs. Non-Hispanic Emergency Department Patients

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Background: The Affordable Care Act (ACA) was intended to improve access to health care. Due to differences in culture/language, Hispanics may be at increased risk to be unaware of the act and misunderstand how to best utilize the benefits provided by the ACA.

Objectives: We conducted an ED-based survey to test the hypothesis that Hispanics would have a lower level of knowledge of ACA vs. non-Hispanics.

Methods: Study design–cross sectional; Setting–inner city, academic ED; Population–Convenience sample, consenting, stable, patients (pts) age > 17. Pts completed a structured, written survey providing demographic information and completed a knowledge assessment quiz with 8 multiple choice questions regarding factual provisions of the ACA. Categorical data presented as frequency of occurrence; continuous data presented as means +/- SD. Bivariate analysis performed to identify variables associated with mean knowledge score performance, then multivariate regression performed to control for covariates; significance level = 0.05; 95% CIs reported. Primary outcome parameter was to compare the mean ACA knowledge scores of Hispanic vs. non-Hispanic.

Results: 1,200 pts enrolled, 53.5% female, mean age 39.9 +/- 14.2 years, 91.2% had % income <50,000, 17.6% with private insurance, 12.2% Republican, 84.0% Christian, 67.6% Hispanic. Bivariate analysis revealed that Hispanics had significantly lower mean proportion correct answers vs. non-Hispanics (0.325 vs. 0.363; p = 0.02). This difference remained significant in the multivariate analysis (p =0.014). Other variables that were significantly associated with lower mean proportion correct in the multivariate analysis were non-Christian religion (0.31 vs. 0.34; p=0.07) and income < $50,000 (0.34 vs. 0.40;; p=0.04). There was no difference in the % of Hispanics vs. non-Hispanics who were opposed to ACA [70.1 vs 66.1%; OR 1.2 (0.8-1.2; p =0.28)]. There was a significant difference in the % of Hispanics vs. non-Hispanics who felt more informed by reading a post-test information sheet [30.1 vs. 23.2%; OR 1.4 (1.0-2.1; p =0.04)].

Conclusion: Hispanic pts had lower mean scores for knowledge of key provisions of the ACA. As Hispanics represent the largest growing U.S. demographic group, further studies are warranted to validate our findings and to evaluate whether poor comprehension of ACA is limiting health care access for this population.

331 Identification and Referral of Emergency Department Patients with a Presentation Suspicious for Underlying Malignancy

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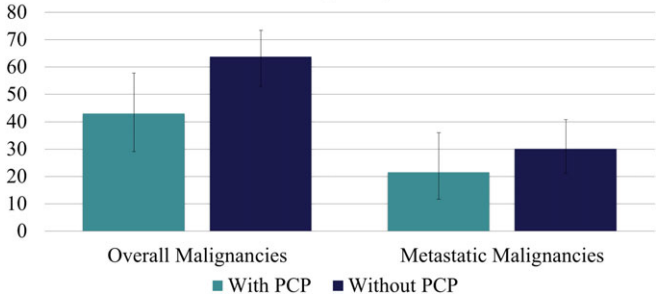
Background: In 2010, the Centers for Disease Control and Prevention reported that neoplasms accounted for 255,000 all United States emergency department primary diagnoses but limited literature is published describing this phenomenon in detail.

Figure 3. Percentage of Patients Diagnosed with Malignancy



Objectives: Our study aims to identify the number of patients who present to a large county hospital with symptoms suspicious for malignancy and quantify their compliance with our internal referral clinic (IRC) system for further malignancy work-up.

Methods: A retrospective chart review at a county hospital with >100,000 annual visits was conducted between 8/18/2014 and 5/23/2015. Patients who presented to the ED and were suspected of having an underlying malignancy with subsequent referral to IRC were included in our analysis. Descriptive statistics were computed for patient demographic characteristics and univariate analysis was performed for patient outcomes.

Results: Overall, 122 patients were referred from the ED to the IRC for a suspected underlying malignancy and were included in our final analysis. The mean age at presentation was 51 (range 18-81), and 64 (52.5%) were women. Of 103 (84.4%) presented to IRC for further work-up of their suspected malignancy, 16 (15.5%) were lost to follow-up after initial visit. There were 6 (4.9%) referred to the IRC for an incidental ED finding. Mean time between ED presentation and IRC visit was 11.4 (range 1-48) days. This included no-shows for an initial visit but ultimately presented for further work-up. Ultimately, 69 (56.6%) patients were diagnosed with cancer. The most common malignancies diagnosed were colorectal (n=14), breast (n=12), and pancreatic cancer (n=9). Patients without a primary care physician (PCP) were more likely to be diagnosed with a malignancy vs those with a PCP (63.8% vs. 42.9%; p=.027). The most common malignancy diagnosed in patients with and without a PCP was pancreatic cancer and colorectal cancer, respectively.

Conclusion: Patients without a PCP were more likely to be diagnosed with a malignancy vs. those with a PCP. The most common malignancy diagnosed among patients without a PCP was one for which there is a national screening protocol. Further analysis is required in order to provide insight into which factors are associated with initial presentation to the emergency department with features suspicious for an underlying malignancy.

332 Factors Associated with Thirty Day Mortality After an Outpatient ED Visit

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Background: There are large variations in outcomes across U.S. hospitals but the degree to which these variations in outcomes exist in emergency care is less well understood.

Objectives: We sought to examine if key hospital characteristics are associated with differences in quality of emergency care among Medicare beneficiaries.

Table 1. Patient and Hospital Characteristics Associated with Thirty-Day Mortality after an Outpatient ED Visit

Variable		Thirty-Day Mortality*	P-Value
Age group	65-74	**1.03%** (0.99% to 1.08%)	<.0001
	74-85	**1.39%** (1.34% to 1.44%)	.
	85+	**2.55%** (2.49% to 2.61%)	.
Gender	Male	**1.77%** (1.73% to 1.82%)	<.0001
	Female	**1.36%** (1.32% to 1.40%)	.
Race	White	**1.55%** (1.51% to 1.58%)	<.0001
	Black	**1.36%** (1.27% to 1.45%)	.
	Hispanic	**1.31%** (1.11% to 1.51%)	.
	Other	**1.37%** (1.22% to 1.52%)	.
Medicaid Eligible	No	**1.47%** (1.44% to 1.51%)	<.0001
	Yes	**1.71%** (1.65% to 1.78%)	.
Hospital Size	Small	**1.63%** (1.55% to 1.71%)	<.0001
	Medium	**1.55%** (1.51% to 1.59%)	.
	Large	**1.37%** (1.30% to 1.45%)	.
Hospital Region	North East	**1.46%** (1.39% to 1.53%)	0.0033
	Midwest	**1.56%** (1.50% to 1.62%)	.
	South	**1.56%** (1.51% to 1.61%)	.
	West	**1.42%** (1.35% to 1.49%)	.
Teaching Status	Major	**1.40%** (1.30% to 1.51%)	0.065
	Minor	**1.50%** (1.45% to 1.56%)	.
	Non-teaching	**1.55%** (1.51% to 1.59%)	.
Profit Status	For Profit	**1.54%** (1.46% to 1.62%)	0.71
	Non-for-profit	**1.51%** (1.47% to 1.54%)	.
	Public	**1.54%** (1.45% to 1.62%)	.

***95% Confidence Intervals are shown in parentheses.**

Methods: We identified all ED visits among continuously enrolled Medicare beneficiaries over the age of 65 in the United States in 2013 using national research identifiable files. We obtained hospital characteristics from the American Hospital Association annual survey. We limited our analyses to outpatient ED visits and excluded visits for patients who died in the ED, had another visit on the same day or an associated observation claim. We focused on the top 40 most frequent outpatient diagnoses, which accounted for nearly 80% of all visits. For patients with multiple visits in a given year, we chose a single visit at random. We summarized 30-day mortality for each clinical condition. We performed linear regression controlling for hospital random effects with patient level 30-day mortality as the outcome with hospital and patient characteristics as predictors.

Results: Our sample consisted of 757,297 visits. The overall 30-day mortality was 1.51% for patients discharged alive from the ED. Older age, male sex, white race and Medicaid eligibility were associated with higher 30-day mortality (Table). The conditions with the highest mortality rates were pneumonia (4.0%), fluid and electrolyte disorders (4.0%), unclassified visits (3.7%) of which the majority were for ICD9 diagnoses of altered mental status or edema, malaise and fatigue (3.1%) and other lower respiratory disease (3.0%). Larger hospitals and those in the Northeast and West had significantly lower mortality adjusting for patient and other hospital characteristics. There was a trend toward lower mortality for teaching hospitals (Table 1).

Conclusion: Larger hospitals in the Northeast have better outcomes for older Medicare beneficiaries coming to the ED. Teaching status may also be associated with improved outcomes. These findings suggest that in emergency for common conditions, where patients go has an important impact on their clinical outcomes.

333 Patient, Physician, and Environmental Factors Associated with Adherence to Cardiovascular Clinical Practice Guidelines in the Emergency Department

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Background: Cardiovascular (CV) diseases including myocardial infarction and stroke are two of the leading causes of death in the US. Both have clinical practice guidelines (CPGs) specific to the ED that have been shown to improve patient outcomes. Variation in adherence

Fitted Multivariate Model: Patient, Physician and Environmental Variables Associated with Adherence		
	OR	95% CI
Gender		
Male	Ref	—
Female	0.78	0.5-1.2
Language		
English	Ref	—
Spanish	0.62	0.4-1.06
Other	0.78	0.3-2.3
Prior Disease (CAD or Stroke)		
Yes	Ref	—
No	1.36	0.9-2.0
Chief Complaint		
Typical	Ref	—
Associated	0.51	0.3-0.8
Other	0.44	0.2-0.9
ED Diagnosis		
Primary	Ref	Ref
Associated	0.30	0.1-0.6
Other	0.22	0.1-0.4
Discharge Diagnosis		
AIS	Ref	—
ACS	0.34	0.2-0.7
STEMI	0.06	0.0-0.1
Admitting Floor		
Ward	Ref	—
ICU	1.5	0.8-2.9
Inpatient Team		
Specialist	Ref	—
Other	0.52	0.2-1.1
Hospital		
Tertiary Academic	Ref	—
Urban County	1.5	0.7-2.9
Rural Community	2.2	1.03-4.8

Table 333: Trent.

and the patient, physician, and environmental factors associated with ED adherence to multiple CV CPGs in the same cohort have never been studied.

Objectives: To estimate adherence variation across CV CPGs in the ED and identify patient, physician and environmental factors associated with adherence variation. The 3 CPGs include: aspirin for acute coronary syndrome (ACS), door-to-balloon time for STEMI, and systemic thrombolysis for acute ischemic stroke (AIS).

Methods: We performed a multicenter retrospective study of patients ≥18, who were admitted to the hospital from the ED, and for whom the ED diagnosed or initiated treatment of the disease. Three unique hospitals were included: urban county, tertiary academic and rural community hospital. The outcome measure, ED adherence to CPG, was independently abstracted by blinded investigators.

Results: Among the 1053 patients, ED care was adherent in 83% of patients with significant variability in adherence between CPGs (71% STEMI, 83% ACS, 96% AIS) and across hospitals (80-88%). In our hierarchical, multivariable model (Table), patients were more likely to receive adherent care if they presented with chief complaints that were typical for the diagnosis and if the primary diagnosis in the ED was specific to the CPG. When patients presented with atypical or unrelated chief complaints, the odds of receiving adherent care in the ED were 0.5 (95% CI 0.3-0.8) for atypical complaints and 0.2 (95% CI 0.1-0.4) for unrelated complaints. When the primary ED diagnosis was associated but not specific to the CPG, the odds of receiving adherent care was 0.3 (95% CI 0.1-0.6), and 0.1 (95% CI 0.02-0.1) for unrelated primary diagnoses. Patient sociodemographics and comorbidities, ED physician experience, admitting service, time of day and day of week were not significantly associated with adherence.

Conclusion: Adherence to ED CV CPGs varies significantly across diseases and hospitals in our cohort. Adherence to ED CV CPGs is most likely to occur when the diagnosis is highly suggested by the patient's complaint and when the diagnosis is the patient's primary ED diagnosis.

334 Readmission Variability Among Emergency Medicine Physicians

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Background: Readmissions are costly and an important indicator of overall hospital quality. Emergency Medicine (EM) physicians make decisions of admission for 50% of hospitalizations. Readmission rates vary widely across hospitals but the individual EM physicians' role in readmissions is unknown.

Objectives: We assess variation in readmission rates among EM physicians and what proportion of readmissions may be attributable to provider variation alone.

Methods: Retrospective study of board certified EM physicians and ED patient encounters (>18 years old) using electronic records over a 6-year period (9/2008-12/2014) at a tertiary Level 1 trauma center with 85,000 visits annually. Physician-level admission and readmission rates were evaluated using logistic regression with a forward selection model including age, sex, Emergency Severity Index, time of presentation, and payer type. Readmission rates and correlations between admission and readmission rates by providers were calculated for return visits for both 30 and 7 days.

Results: 369,906 patient encounters, by 55 physicians, resulted in 117,256 admissions. 26,732 of the admitted patients revisited the ED within 30 days and 14,463 (53.81%) were readmitted. 6,492 patients revisited the ED within 7 days and 3,289 (50.35%) were readmitted. Median adjusted 30- and 7-day readmission rates were 44.9% (range: 28.8-66.2%) and 41.1% (range: 24.5-70.3%), respectively. Median rate for providers who had high rates of 30-day readmission (upper quartile) was 52.6% compared to 41.1% for all others. Physicians who were high admitters were also high readmitters with a large correlation between admission and 30-day readmission rate ($r = 0.84$, $n = 55$, $p < 0.0001$). 71% of variation in readmission rates can be accounted for by physician-specific rates of admission for 30-day return visits.

Conclusion: We demonstrate wide variation in readmission rates and an association between admission and readmission rates by EM physicians after accounting for pertinent clinical information. These findings suggest a portion of readmissions can be explained by physician-level admission behaviors alone. There may be opportunities to meaningfully reduce readmission rates from the ED by not only focusing on systems level issues but also on individual physician behavior.

335 Temporal and Geographic Characteristics of Synthetic Marijuana Emergencies in a Metropolitan EMS System

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Background: Patient characteristics associated with synthetic marijuana (SM) emergencies have been described, but no studies have reported the temporal or geographic aspects of SM outbreaks.

Objectives: To describe the temporal evolution and geographic distribution of SM emergencies encountered in one metropolitan EMS system, and explore whether increased cases in one geographic area foreshadow increased cases elsewhere.

Methods: The metropolitan area (1,023 square miles; 1.2 million population) is served by a single municipal EMS system. The EMS medical director's office tracks SM-related cases based on dispatch information and reports from on-scene paramedics, including the location, number of patients and dispositions. Case data for the most recent SM outbreak (May-Oct 2015) were used to construct traditional epidemic curves showing case numbers over time. The block address of each case was mapped to identify geographic concentrations. Finally,

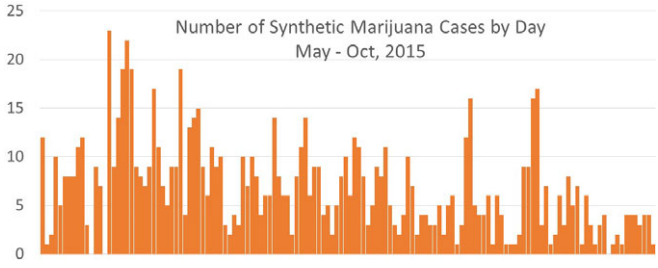

Figure 335 – Hearnsberger

autoregressive Poisson regression modeling was used to explore whether increased cases at high-concentration locations foreshadowed increased cases in the rest of the area over the ensuing six-day period.

Results: There were 849 SM-related EMS responses involving 920 patients. The epidemic curves suggested a continuing source outbreak. There was a distinct geographic focus of cases, with 407 patients (44%) presenting in a concentrated area surrounding a downtown homeless shelter and contiguous night club district. Cases were distributed throughout the week; 61% occurred on day shift (7a-7p). Most (89%) patients were transported to an ED, including 20 (2.2%) teenagers transported to a pediatric ED. Increased cases in the concentrated shelter/nightclub area did not foreshadow increased cases elsewhere (ensuing day 1 through day 6, all $p>0.05$).

Conclusion: The SM outbreak in this metropolitan area was consistent with a continuing source outbreak. There was a geographic concentration of cases, which could help guide a targeted public health response, but increasing cases in that area did not foreshadow increased cases elsewhere. Other notable observations were that cases were distributed throughout the week and across both daytime and nighttime hours, and that a small but worrisome number of cases involved pediatric patients.

336 Impact of an Electronic Health Record Sepsis Screen on Antibiotic Stewardship in the Emergency Department

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Background: Antibiotic timing is a critical element of sepsis management in the emergency department (ED). In order to improve early identification and treatment of sepsis, there is great interest in developing automated, electronic health record (EHR) based screening systems which identify at risk patients. The impact of these screening systems on antibiotic prescribing in the ED is unknown.

Objectives: Our objective was to assess the impact of an EHR based sepsis screening system on antibiotic prescribing in the ED. Our hypotheses were that antibiotic use and time to antibiotics would improve in patients with sepsis while antibiotic overuse would occur in non-septic patients identified by the EHR screen.

Methods: An EHR sepsis screen and alert system was implemented in July 2014. This system is triggered by abnormal vital signs. We performed a pre/post-implementation chart review comparing adults who presented with fever plus an additional abnormal vital sign. Two blinded reviewers determined if patients met criteria for sepsis with tiebreaker review if needed. Data collected included antibiotic prescribing and time to antibiotics. Outcomes were analyzed with χ^2 or *t* test.

Results: 337 patients with fever plus abnormal vital sign were identified pre-implementation and 323 post-implementation. 225 patient encounters pre-implementation and 211 post-implementation met sepsis criteria. 71.6% and 76.7% of septic patients received antibiotics in the pre/post periods respectively ($p=0.24$). In patients who were not septic, 18.8% in the pre-implementation group received antibiotics compared to 17.0% in the post-implementation group ($p=0.73$). Time to antibiotic in septic patients was 127 minutes pre compared to 162 minutes post ($p=0.004$).

Conclusion: Antibiotic use did not change significantly for either septic or non-septic patients in our ED following the implementation of an EHR sepsis screening system. Time to antibiotics increased significantly following implementation of the EHR sepsis screening system. This unexpected finding may reflect an increased utilization of lactate to diagnosis sepsis. While lactate is critical for stratification of sepsis severity and guiding resuscitation, waiting for this additional lab before initiating antibiotic therapy may result in a significant treatment delay.

337 Implementation of National Professional Society Position Statements on Pre-Hospital Termination of Resuscitation in Statewide Treatment Protocols

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Background: ACEP issued a policy statement in 1997 on "Discontinuing Resuscitation in the Out-of-hospital Setting", followed in 2011 by the NAEMSP position statement "Termination of Non-Traumatic Cardiopulmonary Arrest". Both statements advocate for termination of resuscitation (TOR) of non-traumatic cardiopulmonary arrest in the pre-hospital setting after a trial of resuscitative measures. Cardiopulmonary arrest with initial presenting rhythm of asystole or PEA not responsive to initial resuscitation is known to have extremely poor outcome.

Objectives: The purpose of this investigation is to describe the extent to which statewide treatment protocols (STP) incorporate the position statements on termination of resuscitation.

Methods: Standardized review of all STPs for TOR protocols. Revision was also captured.

Results: Thirty states issue STPs. All 30 states have had protocol revisions since the ACEP statement. Two STPs have not been revised since the NAESP statement, one of which does not allow for TOR. Of the thirty states with STPs, four have no TOR protocol, therefore requiring ongoing resuscitation and transport for all non-traumatic cardiac arrests. Of the 26 remaining states, 6 allow EMS providers to terminate care without consultation of online medical control, providing that specific criteria have been met. These criteria are widely variable with time requirements from 15 to 40 minutes, whether TOR is allowed for VF/VT arrest, requirement of advanced airway, which drugs must be used and whether ACLS is required.

Conclusion: Prehospital care is increasingly driven by evidence-based practices, and reinforced by professional bodies through position statements. STPs have considerable variability with respect to what constitutes an adequate trial of resuscitation. Every STP state included has undergone protocol revisions since the ACEP policy statement, and 2 states have not had revisions since the NAEMSP position statement, making protocol revision cycles unlikely to be a contributing factor in the failure of implementation by the remaining 4 states. Further studies to better understand attitudes toward what constitutes futile resuscitation, as well as barriers to termination of resuscitation in the pre-hospital setting are needed.

338 Airway Ultrasound for the Confirmation of Endotracheal Tube Placement in Military Flight Medic Trainees

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Background: Confirming correct endotracheal tube (ETT) placement is a key component of successful airway management. Ultrasound (US) as a tool for the confirmation of ETT placement has been investigated in the hospital setting but not in the pre-hospital setting performed by pre-hospital providers. This study investigates whether military flight medic trainees can successfully use airway US to

distinguish between tracheal and esophageal intubations in cadavers after a brief educational session.

Objectives:

Methods: Consented participants were presented a short didactic presentation on airway US techniques. Each participant then performed one US on a practice cadaver. For each participant, the cadaver was randomly assigned to a tracheal or esophageal intubation using a random number generator and then intubated by study investigators. ETT placement was confirmed using the presence or absence of breath sounds at the midaxillary line bilaterally and over the epigastrium and direct visualization. Each participant performed an airway US, and time to verbalize ETT location was recorded. Participants were asked whether they felt airway US would be a useful adjunctive skill for ETT placement confirmation.

Results: Thirty-two military flight medic trainees were enrolled, and 71.9% correctly identified ETT placement using airway US. US had a sensitivity and specificity of 71.4% and 72.2%, respectively. The positive and negative predictive values were 66.7% and 76.5%, respectively. Mean time to report ETT placement was 47.3 seconds. Time did not vary significantly based on reported (p=0.667) or actual ETT placement (0.614) nor between medics with accurate identification versus inaccurate identification (p=0.176). 83% of participants felt airway US would be a useful adjunctive skill for the identification of ETT placement.

Conclusion: Military flight medic trainees were able to rapidly use airway US to identify ETT placement after a short educational session with moderate sensitivity and specificity. These advanced military medics are interested in learning and implementing this skill into their practice. With more extensive training, airway US may be a useful adjunct for the confirmation of ETT placement in the hands of military flight medics.

339 Post-splinting X-Rays of Non-Displaced Hand, Wrist, Ankle, and Foot Fractures are Unnecessary

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Background: Acute non-displaced fractures (NDFs) are very common in the ED and some physicians advocate for obtaining post-splinting x-rays to identify potential displacement that can occur during the splinting process. Obtaining these x-rays requires extra time, cost, and radiation exposure to patients.

Objectives: Our objectives are (1) to determine how often x-rays are obtained after splinting of NDFs of the hand, wrist, ankle, or foot; (2) to identify if post-splinting x-rays changes treatment management in the ED; (3) to identify if there are medical complication at follow-up in patients that do not receive post-splinting x-rays.

Methods: This is a retrospective chart review study of a cohort of ED patients who were discharged with hand, wrist, ankle, or foot fractures. Electronic medical records were reviewed to determine those patients with NDFs (as read by the reading radiologist) and underwent splinting with or without post-splinting x-rays. Post-splinting x-ray reports were evaluated to determine whether displacement had occurred during the splinting procedure. For the group that did not undergo post-splint x-rays in the ED, follow-up medical records within two month of the initial ED visit (in-network only) were reviewed to assess for follow-up x-rays and management decisions.

Results: 265 patients met the study criteria and were included (138 male; age range 1-94; average 37.2). 27 patients (10.2%) had post-splinting x-rays performed in the ED. None of these patients had interval fracture change or management change (i.e. resplinting). 204 patients followed up within our health system. 179 patients underwent x-rays at the clinic follow-up visit. 14 of these patients had interval displacement of the fracture and one of these patients had surgical fixation (bimalleolar ankle fracture).

Conclusion: Of the 206 patients who had post-splinting x-rays obtained in the ED or follow-up clinic, 1 (.005%) had change in management based on the interval fracture change from pre-splinting x-rays. Post-splinting x-rays of NDFs do not change ED management of patients and rarely change patient follow-up management.

340 Patient Self-Awareness of Ankle Fracture

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Background: In recent years, efforts have been made to develop decision tools to determine the need for radiography in trauma to the extremities. The goals are to use the test in the range for highest Bayesian value, to limit unnecessary exposure to ionizing radiation and to decrease health care expenditures. Typical US charges for ankle X-rays range from 180 to 650 dollars. Ottawa ankle rules and other decision tools can be helpful. These rules include location of pain and ability to bear weight both immediately after injury and in the emergency department. These decision tools have been found to be successful in large, multi-center confirmatory studies. Teaching the rules to patients has not been proven effective.

Objectives: The purpose of this study is to examine if a patient's perception of whether or not they have an ankle fracture can help define the need for a radiograph.

Methods: This was a prospective, non-randomized emergency department (ED) study conducted in two hospitals in different US states: one a medium-sized community hospital and the other a tertiary university hospital. Both hospitals utilize rapid-track, low acuity zones in the ED where most ankle injuries are seen. Patients presenting to the ED with ankle injury were consented for the study and then asked if they thought their ankle was broken, and their prediction was compared to their subsequent x-ray result. Fischer's exact test was used with significance level of 0.05 using SAS statistical software.

Results: The study was executed from 3/1/2014 to 4/30/2015, and 68 patients were enrolled, with only 2 refusals. Subjects were 47% female. There were 45 patients who answered yes to the primary question "is your ankle broken," and 23 answered no. Radiographs were classified in a dichotomous fashion based on presence or absence of fracture on blinded radiology reading. The P value was found to be 0.899 which was not statistically significant. No patients were suspected of being intoxicated, and no elective alcohol blood testing was conducted. No patients reported taking opiate medications prior to the evaluation.

Conclusion: Patients presenting to the ED with ankle trauma were not able to predict whether they had a fracture prior to radiographic evaluation. Asking the patient this question is not likely to contribute to a decision rule to determine the need for a radiograph.

341 Emergency Department Utilization for Poisoning-Related Visits

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Background: In recent years, there has been an increase in poisoning-related emergency department (ED) visits. How ED resource utilization has changed for these visits is less well described.

Objectives: This study examines utilization for poisoning-related visits in EDs over time.

Resource	2003-4 % Visits	2010-11 % Visits	% Change	p-Value
Any procedure	57.8%	53.1%	-8.1%	0.238
Laboratory study	68.9%	68.6%	-0.4%	0.927
EKG	37.5%	34.8%	-7.2%	0.485
X-ray	20.1%	17.5%	-12.9%	0.375
CT scan	6.7%	14.6%	117.9%	0.002
Admission rate	17.6%	23.6%	34.1%	0.114
ICU admission	9.6%	6.0%	-37.5%	0.151

Table 341: Mazer-Amirshahi.

Methods: A retrospective review of data from the National Hospital Ambulatory Medical Care Survey, 2003-2011 was conducted. All ED visits with a reason for visit or ICD-9 code related to poisoning were included. We examined the number of ED visits and resources used including diagnostic studies and procedures performed, medications provided, admission rates, and length of stay. The proportion of visits involving resource use was tabulated and trends analyzed using survey-weighted logistic regression, grouping into 2 year periods to ensure adequate sample size.

Results: Of an estimated 843 million ED visits between 2003 and 2011, 8 million (0.9%) were related to poisoning. Visits increased from 1.8 million (0.8%) visits in 2003-4 to 3.0 million (1.1%) visits in 2010-11, p=0.001. Use of laboratory studies, EKGs, plain radiographs, medications ordered and procedures remained stable across the study period. CT use more than doubled, increasing from 5.2% to 13.7% of visits, p=0.001. ED length of stay increased 35.5% from 254 to 344 minutes, p=0.001. Admission rates increased 45.3%, from 15.0% to 21.8%, p=0.046. Over the entire study period, 52.0% of poisoned patients arrived via ambulance, and 3.0% of patients had been discharged from the hospital within the previous seven days.

Conclusion: Poisoning-related ED visits nearly doubled over the 8-year study period; poisonings are resource-intensive visits that increasingly rely on CT, and require increasingly longer lengths of ED stay or hospital admission. Ultimately, these visits may contribute to ED crowding and adverse patient outcomes.

342 Efficacy of Intravenous Cobinamide Versus Hydroxocobalamin or Saline for Treatment of Severe Hydrogen Sulfide Toxicity in a Swine (Sus Scorfa) Model

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Background: Hydrogen sulfide (H2S) is a potentially deadly gas that naturally occurs in petroleum and natural gas. The Occupational Health and Safety Administration cites H2S as a leading cause of workplace gas inhalation deaths. H2S is also an attractive terrorism tool because of its high toxicity and ease with which it can be produced. Although unlikely to cause casualties when released in open spaces, in closed spaces, such as aircraft, fatalities could occur. Several potential antidotes are available for hydrogen sulfide poisoning but none have been completely successful.

Objectives: To compare the time to spontaneous ventilation among groups of swine with acute H2S induced apnea treated with intravenous (IV) cobinamide, IV hydroxocobalamin or saline.

Methods: Twenty-four swine (45-55 kg) were anesthetized, intubated, and instrumented with continuous femoral and pulmonary artery pressure monitoring. After stabilization, anesthesia was adjusted such that animals would spontaneous ventilate with an FIO2 of 0.21. Sodium hydrosulfide (NaHS; concentration of 8 mg/ml) was begun at 1 mg/kg/min until apnea was confirmed for 20 seconds by capnography. This rate was sustained for 1.5 minutes post apnea, then decreased to 0.7 mg/kg/min for 3 minutes, then decreased to 0.1 mg/kg per minute for the remainder of the study. One minute post apnea animals were randomly assigned to receive cobinamide (4.2 mg/kg), hydroxocobalamin (4 mg/kg) or saline and monitored for 60 minutes. G* power analysis using the Z test determined that equal group sizes of 8 animals were needed to achieve a power of 80% in detecting a 50% difference in return to spontaneous ventilations at α=0.05.

Results: There were no significant differences in baseline variables. Moreover, there were no significant differences in the mg/kg dose of NaHS (5.6 mg/kg; p=0.45) to produce apnea. Whereas all of the cobinamide treated animals survived, none of the control or hydroxocobalamin treated animals survived. Mean time to spontaneous ventilation in the cobinamide treated animals was 3.2 minutes.

Conclusion: Cobinamide successfully rescued the severely NaHS-poisoned swine from apnea in the absence of assisted ventilation.

343 Characteristics of United States Emergency Department Visits for Pediatric Foreign Body Aspirations

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Background: Foreign body aspirations (FBA) in children are a common cause of morbidity and mortality. The National Safety Council estimates that 2900 pediatric deaths occur annually in the United States (US) from FBAs. Airway foreign bodies in children younger than 1 year are the third most common cause of death due to unintentional injury. FBAs are an important preventable cause of unintentional injury in children.

Objectives: To investigate the epidemiology of FBAs in children less than 18 years of age presenting to US emergency departments during calendar year 2014.

Methods: A retrospective analysis of the National Electronic Injury Surveillance System (NEISS) database was conducted. The NEISS database is a national probability sample of US emergency departments and collects patient data from consumer-related injuries. Inclusion criteria were all FBAs seen in US hospital emergency departments during calendar year 2014 in children less than 18 years of age. All FBAs presenting to the US during 2014 were stratified by age group, gender, locale of injury, consumer product aspirated, and disposition from emergency department. National estimates and confidence intervals were calculated using the complex statistical design of the NEISS database.

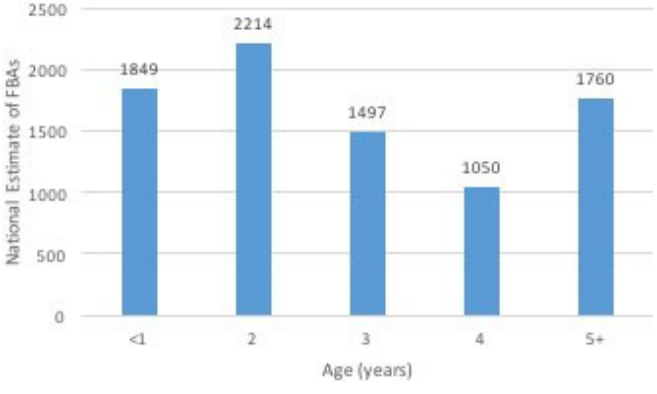

Figure 343 – Bandzar

Results: An estimated 9730 pediatric FBAs were seen in US hospital emergency departments during 2014 (95% CI 5534-13926). Females accounted for 52% of the FBAs during the study period. The two most common foreign objects aspirated were jewelry (19%) and coins (16%). Children 2 years of age accounted for the majority of FBAs (see Figure). Whites accounted for the majority of FBAs (42%). The majority of FBAs occurred at home (61%) and were treated and discharged from the emergency department (79%).

Conclusion: Jewelry was the most common foreign body aspirated in children less than 18 years of age. The majority of FBAs occurred at home. Further efforts are warranted to explore safety measures and prevent FBAs in children.

344 CommunityRx: Connecting Health Care to Self Care in an Academic Emergency Department on Chicago's South Side

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Background: The Chronic Care Model requires creating connections between health systems and communities. Emergency departments (EDs) play an important role in chronic disease care in high-poverty communities; however, few reports describe ED-based referrals to community self-care resources.

Objectives: To create an inventory of community resources in a high-poverty, urban geography, and to assess the feasibility of an electronic medical record (EMR) enabled system for providing diagnosis-driven self-care resource referrals. We hypothesize that self-care resources are available in high-poverty communities and can be used effectively to target chronic disease management goals following an ED visit.

Methods: CommunityRx (Centers for Medicare & Medicaid Services Health Care Innovation Awards) employed youth to conduct a census of self-care assets. Ontologies mapping self-care resources to disease diagnosis codes were developed. An e-prescribing system integrated with the EMR generated personalized referrals, HealtheRx, to self-care resources near a patient's home. A HealtheRx was generated at each visit for patients residing in a 16 ZIP code region (58% of households below 200% federal poverty level).

Results: From 11/2013 - 5/2015, a total of 36,514 HealtheRxs were generated for 24,007 unique patients (median age 39 years, IQR 27-56 years). Of these, 8,648 (36%) had ≥ 2 chronic diseases, including asthma (19%) and diabetes mellitus (10%). For asthmatics, availability of the top 3 resources in a patient's home ZIP code was: 0-3.0 pharmacies/patient (mean 0.5), 0-0.1 mold removal assets/patient (mean 0.01), and 0-0.01 smoking cessation classes/patient (mean 0.0). Few asthmatics (3%) had access to all 3 resources in their home ZIP code. For diabetics, availability of the top 3 resources in a patient's home ZIP code was: 0.03-5.0 food pantries/patient (mean 0.6), 0-4.0 foot care assets/patients (mean 0.4), and 0-2.0 eye specialists/patient (mean 0.2). The majority of diabetics (88%) had access to all 3 resources in their home ZIP code.

Conclusion: CommunityRx connected patients to local self-care resources for chronic disease management. Self-care resources can be found in high-poverty communities, although resource availability varies by chronic disease diagnosis.

345 Violence Prevention Efforts: Methods to Retain Participants in Youth Violence Research

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Background: Violence is the leading cause of death among urban youth 14- 24. Hospital and ED based violence prevention programs are increasing and a critical part of community public health efforts.

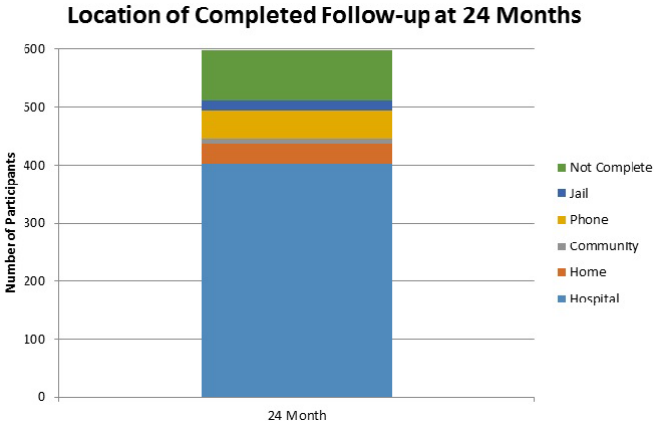

Figure 345 – Clery

Successful evaluation of research and prevention efforts is aided by retention of study participants. Very little has been previously described regarding optimizing follow-up methods violently injured patients.

Objectives: Describe methodology for retention in youth violence studies and the characteristics of difficult to reach participants.

Methods: The Flint Youth Injury (FYI) Study is a 2-year prospective cohort study following a cohort of assault-injured drug-using youth recruited in an urban Level-1 ED, as well as a comparison population of drug-using youth seeking medical or non-violence related injury care. Validated survey instruments were administered at baseline and four follow-up time points (6, 12, 18, 24 months). Follow-up contacts proceeded using a variety of strategies (table 1) and all attempts were coded by type and level of success. Regression analysis was used to predict contact difficulty over the entire 24 months.

Results: 599 patients age 14-24 were recruited in the ED (mean age = 20.1 years, 41.2% female, 58.2% African American), and follow-up rates at 6, 12, 18, and 24 months were 85.3%, 83.7%, 84.2%, and 85.3% respectively. High follow-up retention was achieved through extensive contact efforts and strategies: participant contact efforts ranged from 2 and 53 times per timeframe to complete a follow-up appointment, and over 20% of appointments had to be completed off-site at community locations including home visits and in jail. Younger participants ($p < 0.01$), African-Americans ($p < 0.01$), and participants with substance abuse/disorder ($p < 0.05$) at baseline, were less difficult to contact over the entire 24 month timeframe.

Conclusion: The FYI study demonstrated that high follow up rates for a difficult-to-track violently injured ED population are possible. This was achieved by employing extensive contact strategies and flexible interview locations which were important for interview completion in the hard-to-reach group.

346 Intermountain Risk Score is Predictive of Hospital Admission and Mortality in Emergency Department Patients

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Background: A recently validated tool to assess risk of mortality was used to analyze thousands of Emergency Department (ED) patients. The Intermountain Risk Score (IMRS) uses age, gender, and components of the complete blood count (CBC) and basic metabolic profile (BMP) to predict mortality. In the recent past, IMRS has been validated in the general population, general medical patients, various cardiology sub-populations and is currently being researched in trauma patients. This study tested whether IMRS is predictive of mortality, admission and 30-day re-admission in ED admissions at this single Level One trauma center with 87,000+ ED visits per year.

Objectives: Stratify the risk of mortality, admission and 30-day re-admission in undifferentiated ED patients.

Methods: All adult patients who presented to the ED from January 2011- December 2013 and had a CBC and BMP performed were

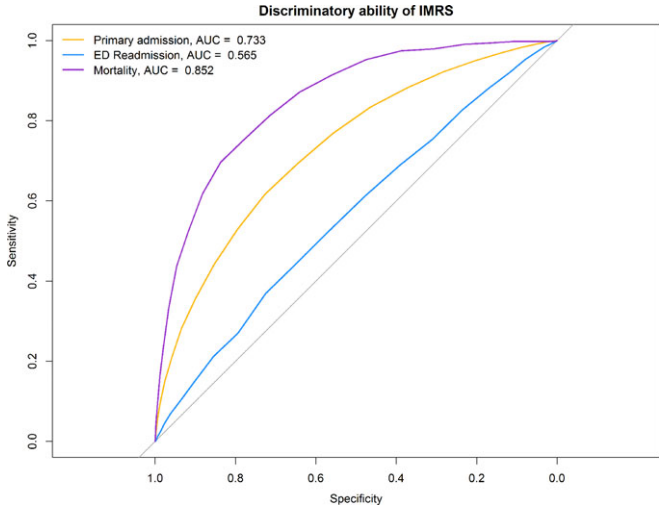

Figure 346 – Morris

evaluated. Patients with more than one ED encounter during this study period were only included for their first encounters. Sex-specific IMRS to predict risk of 30-day mortality, hospital admission and 30-day re-admission were calculated using multivariable modeling of components of the CBC, BMP, and patient age.

Results: During the study period, 67,329 patients were eligible for and are included in the analysis. 55.6% (n=37,473) are female. The median age in years is 44 (IQR: 30-61). 1.3% (n=864) died within 30 days, 27% (n=18,105) were admitted, and 7.8% (n=1410) experienced 30-day hospital readmission. The IMRS was found to have good predictive value in high-risk patients for 30-day mortality (AUC - 0.852), primary hospital admission (AUC =0.733), but poor predictive value for 30-day hospital readmission (AUC- 0.565). (See Morris figure 1)

Conclusion: IMRS strongly predicts hospital admission and 30-day mortality in high risk Emergency Department patients at this single Level I trauma center. The IMRS can help quickly and accurately determine a patient's risk category, and may help clinicians determine an appropriate disposition while in the ED. Further prospective studies are needed to validate these findings.

347 Predictors of Thoracic Injury After Blunt Torso Trauma in Children Presenting to an Emergency Department as Trauma Activations

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Background: A previously published study reported predictors of thoracic injury in children following blunt torso trauma to include low systolic blood pressure, elevated respiratory rate, abnormal results on thoracic examination, abnormal chest auscultation findings, femur fracture, and a Glasgow Coma Score < 15.

Objectives: The objective of this study is to identify predictors of thoracic injury in children presenting as trauma activations to a Level 1 trauma center after blunt torso trauma, and to compare these predictors to those previously reported in the literature.

Methods: We performed a retrospective chart review of pediatric patients (< 18 years) who presented to the emergency department of a Level 1 trauma center between 7/2010 and 7/2013 as a trauma activation after sustaining a blunt torso trauma and who received diagnostic imaging of the chest (chest x-ray and/or CT scan) as part of their initial evaluation. Patients who were designated Level 1 trauma activations or who were transferred to our facility after initial evaluation at an outside emergency department were excluded.

Results: Data analysis was performed on 168 patients (mean age 11.8 years, 43% resulting from a motor vehicle collision). There were 33 patients (20%) with 45 abnormalities detected on diagnostic imaging of the chest, with the most common abnormalities being lung contusion (36%) and pneumothorax (22%), and 6% (2/33) requiring tube thoracostomy. Statistically significant predictors of abnormal diagnostic imaging of the chest included Glasgow Coma Score < 15 (27% with abnormality versus 13% without abnormality; odds ratio 2.58), hypoxia (22% versus 5%; odds ratio 5.57), syncope/dizziness (55% versus 35%; odds ratio 2.25), cervical spine tenderness (12% versus 3%; odds ratio 4.45), thoraco-lumbar-sacral spine tenderness (41% versus 17%; odds ratio 3.37), and abdominal/pelvis tenderness (12% versus 3%; odds ratio 4.52).

Conclusion: Based on our data, predictors of thoracic injury in children after blunt torso trauma include Glasgow Coma Score < 15, hypoxia, syncope/dizziness, cervical spine tenderness, thoraco-lumbar-sacral spine tenderness, and abdominal/pelvis tenderness. Discrepancies with previously published data necessitate a prospective, multi-centered study.

348 Management and Outcomes of Spontaneous Pneumomediastinum in Children

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Background: The management of spontaneous pneumomediastinum in the pediatric population is highly variable. CT scan, contrast esophagram and laryngoscopy are possible diagnostic adjuncts, and patients are frequently admitted to the hospital.

Objectives: Our objective was to characterize the management of pediatric pneumomediastinum, determine the diagnostic yield of advanced imaging and describe admission outcomes.

Methods: We performed a retrospective review of all patients with ICD 9 code 518.1 (pneumomediastinum) presenting to a single tertiary pediatric ED between 1/2008 and 4/2015. Patients were excluded if they had a history of trauma or were found to have wheezing or respiratory distress on exam. Data included symptoms, physical exam findings, diagnostic testing, medical interventions, disposition and outcomes, including progression of symptoms and readmission.

Results: We identified 96 patients with spontaneous pneumomediastinum. The mean age was 14.1 years (SD 3.1), with 70% males. Associated symptoms were chest pain (81%), cough (33%), odynophagia (26%), and vomiting (16%). Diagnosis was established by CXR in 86 (90%) patients, chest CT in 9 (9%) and by incidental abdominal CT finding in 1 patient. Seventy one per cent of patients (n = 68) were admitted and underwent further studies, including repeat CXR (46; 68%), chest CT (44; 65%), esophagram (24; 35%), laryngoscopy (8; 12%). For the 28 of 96 patients discharged, additional studies performed in the ED included chest CT (10; 36%) and esophagram (6; 21%). In all patients, admitted and discharged, further studies did not yield additional diagnostic information. No patients received an intervention. The average length of stay in admitted patients was 26 hours (SD 16.7). The average length of stay in those discharged was 3.8 hours (SD 1.5). Two patients returned to the ED within 72 hours for persistent chest pain and both were discharged.

Conclusion: The majority of patients with spontaneous pneumomediastinum evaluated in our ED are diagnosed by CXR, admitted to the hospital and undergo additional diagnostic studies which do not yield further diagnoses or lead to interventions. Our data suggest these patients can be managed more conservatively with observation, avoiding exposure to radiation and invasive procedures.

349 Reducing Medication Errors and Time in Vasoactive Drug Preparation and Delivery During Pediatric Resuscitation: A Randomized Controlled Trial.

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Background: Acute life-threatening conditions require immediate cardiopulmonary resuscitation (CPR). When required during pediatric CPR, vasoactive drug preparation for continuous infusion is complex and time-consuming and places children at higher risk for medication errors than adults. Moreover, survival is inversely correlated to CPR duration. To address these problems, we developed an innovative, customizable, award-winning mobile application, PedAMINES©, designed to drive nurses and doctors step-by-step from preparation to delivery of a wide range of drugs, especially those requiring continuous infusion.

Objectives: To determine whether PedAMINES© would reduce time to drug preparation (TDP) and delivery (TDD), as well as medication errors in pediatric CPR compared to conventional drug preparation.

Methods: An open randomized controlled crossover trial in which pediatric emergencies-certified nurses were asked first to prepare a continuous infusion of dopamine, using either PedAMINES© (intervention group) or conventional drug infusion rate table method (control group), and then a continuous infusion of norepinephrine by crossing the procedure. The study was conducted during a standardized video-recorded simulation-based pediatric CPR cardiac arrest scenario on high-fidelity manikins (Laerdal SimJunior™) in a Swiss University Hospital. TDP and TDD (primary outcomes), as well as medication errors (secondary outcome) were analyzed using Mann-Whitney test or Wilcoxon test for paired data and Fisher exact test or exact McNemar test.

Results: Twenty nurses were randomized into 2 groups. During the first study period, mean TDP while using PedAMINES© and conventional preparation method was 128 seconds (95%CI 102-154) and 308 seconds (95%CI 216-400) respectively (= 180 sec (58%) time reduction, P<0.0001). Mean TDD was 214 seconds (95%CI 171-256) and 391 seconds (95%CI 298-483) respectively (= 177 sec (45%) time reduction, P<0.0001. See Fig 1). Medication errors were reduced from 70% to 0% (p=0.0001) by using respectively conventional preparation methods or PedAMINES©.

Conclusion: PedAMINES© reduced dramatically the medical errors rate, TDD and TDP. Knowing that CPR duration is inversely correlated to survival, PedAMINES© might contribute to decrease CPR time and increase patient survival.

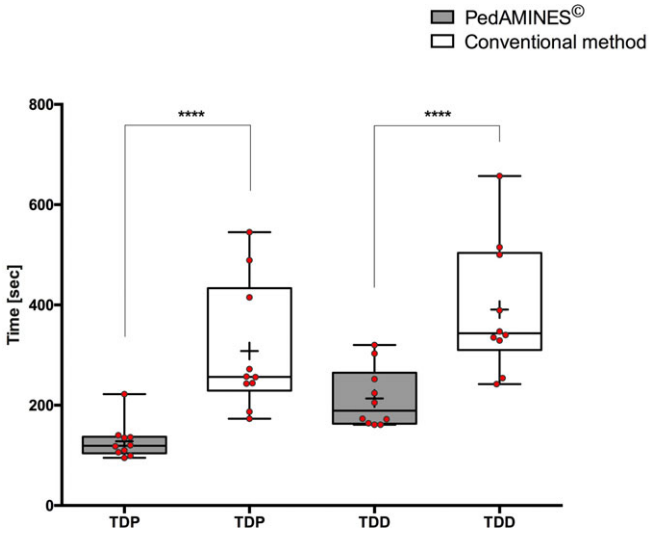

Fig. 1. Boxplots of elapsed time to drug preparation (TDP) and to drug delivery (TDD) in intervention group (PedAMINES©) and control group (conventional method). Solid horizontal lines in the middle of the box denote median; the whiskers go down to the smallest value and up to the largest; + denotes mean. Red open circles denote each individual value. Time is expressed in seconds. P-values are the result of Mann-Whitney test. * p < 0.05; ** p < 0.01; *** p < 0.001, **** p < 0.0001

350 Pediatric Critical Event Debriefing in Emergency Medicine Training Programs

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Background: A *critical event* (CE) is an emotionally-charged occurrence with the potential to overwhelm usual coping mechanisms. In the emergency department (ED), CEs like death and severe illness are not uncommon. A *critical event debriefing* (CED) is a semi-structured meeting that allows for CE review, discussion of performance, identification of errors, and development of future plans.

Objectives: This study evaluates how program directors (PDs) training providers in pediatric emergency care - in emergency medicine (EM) residencies and pediatric emergency medicine (PEM) fellowships - currently use CED after CEs involving children. We also seek to describe PDs' perception of ideal CED practice and identify barriers to use of CED in training programs.

Methods: We surveyed PDs from all US EM residency and PEM fellowship programs regarding pediatric CED. Data were obtained on current CED practices and PDs' perception of ideal CED practices. Data were analyzed using descriptive statistics, chi-square, and two-sample tests of proportion.

Results: This study included 112 PDs, 66 from EM and 46 from PEM programs (46% overall response rate - 40% EM and 59% PEM). Of all PDs, 27.7% (18.5% EM, and 39.0% PEM) felt debriefings were *always* useful. Compared to current practice, PDs felt that CEDs should ideally be held sooner after the CE (p<0.001), include more non-clinical staff (p<0.001), and be held more frequently after unexplained infant death, significant injury, child abuse, and clinical error (p<0.01). Reported barriers to CED included timing (75.9%), scheduling (68.8%), location (47.3%), physician discomfort with CED (43.8%), participant buy-in (31.3%), and leader buy-in (27.7%).

Conclusion: Overall, PDs from both EM and PEM training programs believe CED after pediatric CEs is useful. Current practices are varied, but in general PDs feel CEDs should be held soon after the CE, should include both non-clinical and clinical staff, and should be held more consistently after certain CEs (unexplained infant deaths, significant injuries, cases of child abuse and incidences of clinical error). Incorporating CED into residency and fellowship training may encourage more use in the ED. Barriers to CED specific to the ED setting should be explored to optimize the implementation of this practice.

351 Utility of a Pediatric Early Warning Score to Identify Disposition of Potential Septic Patients in a Pediatric Emergency Department

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Background: Sepsis in pediatric patients accounts for a significant amount of morbidity and mortality and can often be difficult to diagnose. Pediatric early warning score (PEWS) is a clinical severity score that has been validated on the pediatric floors and Emergency Department (ED) to identify evolving clinical deterioration. The utility of PEWS for detection of specific disease states, such as sepsis, is unknown.

Objectives: To determine how well PEWS predicts disposition status in pediatric patients in sepsis or septic shock.

Methods: A retrospective electronic chart review was performed from December 2013 through April 2015 of all ED visits for patients 0-17 years of age who presented to an academic pediatric ED. Patients included in the study had to meet criteria for enrollment in the American Academy of Pediatrics: Pediatric Septic Shock Collaborative

Table 1

Total PEWS score	Total admitted	Total number in group	Percent admitted
0	17	24	70.8
1	12	22	54.5
2	26	38	68.4
3	20	32	62.5
4	8	12	66.6
5	10	14	71.4
6	11	14	78.5
7	16	17	94.1

(PSSC) based on the trigger tool including vital signs and physical exam (appendix A). If patients had multiple visits with sepsis, only their first visit during this time period was included. These visits were then queried for age, race, gender, disposition, length of stay, treatment given (antibiotics, vasopressors, IV fluids), and PEWS score 0-11.

Results: 192 visits, 175 had PEWS documented (173 individual patients). 52.6% were male; median age was 39 months (IQR: (19, 148). 44.5% Caucasian, 28.9% African American, 6.4% Asian and 20.2% were unknown. 120 (69.4%) were admitted. Median length of stay for discharged patients is 3.2 hours and forinpatients is 55.1 hours. For admitted patients, median PEWS was 3 (interquartile range = 2 to 5); for discharged patients, median PEWS was 2 (interquartile range = 1 to 3). 73% of patients with PEWS ≥ 3 were admitted; 65% of patients with PEWS < 3 were admitted (table 1). The odds of admission with PEWS score ≥ 3 are 43% higher than the odds of admission with PEWS score < 3. The nonparametric version of Cochran-Armitage test for trend relating PEWS score to disposition was 1.79 (p=0.07), suggesting that the proportion of admission might increase with PEWS score.

Conclusion: PSSC patients with a PEWS >3 may have a greater probability of being admitted. PEWS may be helpful in predicting disposition of patients who initially meet criteria for sepsis. More research is needed to determine if PEWS is a predictor of septic patients.

352 An Emergency Department-Based Creatinine Clearance Formula for Pediatric Patients

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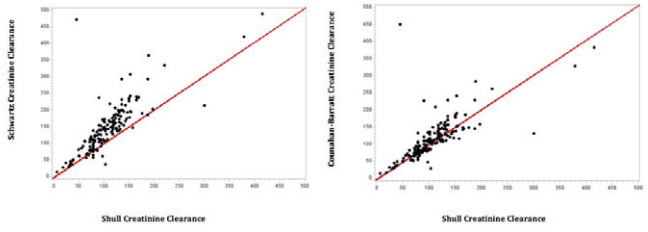
Background: In an effort to prevent the progression to acute kidney injury, tools to estimate creatinine clearance (CrCl) or glomerular filtration rate are commonly available in adult emergency departments (ED) to guide the administration of potentially nephrotoxic agents. Despite the risk to children, there are no validated tools to facilitate the prompt estimation of CrCl for ED pediatric patients. The pediatric nephrology community recommends a CrCl formula that utilizes height/length, however these measures are not routine in the ED. It is unclear whether a formula that does not incorporate height/length would be a valid tool in the ED to guide the management of interventions that could influence renal health.

Objectives: To assess the performance of an equation to estimate CrCl among ED pediatric patients that does not utilize height or length.



The Pearson's correlation coefficient r between the Shull and Schwartz equations was 0.79 (p<0.0001); between the Shull and Counahan-Barratt was 0.71 (p<0.0001)

Figure 352 – Elie

Methods: A retrospective study of pediatric subjects presenting to a academic pediatric ED from 2001-2011. Retrospective calculations of CrCl were performed by employing the Schwartz (SZ) and Counahan-Barratt (CB) equations, which require height or length, and the Shull equation which does not. Analyses of correlation, kappa coefficients, and Bland Altman were performed.

Results: 174/850 (20%) subjects met criteria for enrollment. In 174 subjects, using the SZ, CB and Shull equations, the mean eCrCl was 142.1 (95%CI 131, 153.1), 113.8 mL/min/1.73 m^2 (95% CI 105, 122.6), and 106.8 mL/min/1.73 m^2 (95% CI 99.2, 114.3), respectively. Using the Shull equation, 59/174 (34%) subjects met criteria for reduced eCrCl defined as <80 mL/min/1.73 m^2. When discriminating between those with and without reduced eCrCl, the kappa coefficient determined that there was fair to good agreement of the Shull with the SZ and CB equations: 0.46 (95%CI 0.32, 0.59); 0.6 (95%CI 0.48, 0.73), respectively. Among subjects with reduced eCrCl, analyses of mean difference revealed good agreement of the Shull with both formulas within the 95% limits.

Conclusion: The Shull equation, has good agreement with equations commonly used in the pediatrics to estimate CrCl and appears to be an acceptable alternative that may be applied in the ED.

353 Application of Hemorrhage After Thrombolysis to Predict Intracerebral Hemorrhage and Outcome After Thrombolysis for Acute Ischemic Stroke in a Community Hospital Emergency Department

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Background: Intracerebral hemorrhage (ICH) is a devastating complication of acute ischemic stroke (AIS) and a known risk associated with the use of tPA for thrombolysis of AIS. The selection of patients for treatment with tPA remains controversial. The hemorrhage after thrombolysis (HAT) score is a proposed risk stratification instrument that was created in 2008 for predicting ICH and outcome after treatment with tPA.

Objectives: We sought to evaluate the ability of the HAT score to accurately predict ICH, mortality, and functional outcome in patients treated with tPA in our ED, with the hypothesis that the HAT score would provide useful stratification.

Methods: We performed a retrospective observational study of patients presenting to our community hospital ED over a 44-month period (from January 2012 to September 2015) with symptoms of stroke who were treated with tPA. Outcomes were determined by medical record review and telephone contact with patients (or the families of patients) discharged from the hospital. We used receiver operating characteristic curves (ROC) to measure the ability of the HAT score [based on (i) presenting NIHSS score, (ii) blood glucose level and history of diabetes, and (iii) initial head CT scan] to predict ICH, and mortality.

Results: A total of 119 patients were treated over the study period. Median age was 68 years (IQR 55 to 84), gender was 55% female, and median NIHSS score was 8 (IQR 4 to 14). Fifteen patients (12.6%, 95% CI 9% to 21%) developed ICH, and 10 patients (8.4%, 95% CI 5% to 16%) died. Increasing HAT scores were associated with increased mortality and ICH rate. Area under the ROC (AUC) for the prediction of any ICH was 0.72 (95% CI .59 to .845, P= .006), for prediction of mortality .60 (95% CI .40 to .81 P=.29),

Conclusion: The HAT score performed moderately well for the prediction of ICH in patients treated with tPA in our hospital, but was less successful in predicting in mortality.

354 Time to tPA Administration and Association with 30-Day Readmission and Mortality.

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Background: The Southeastern US has the dubious distinction of having the highest US concentration of stroke patients with the highest morbidity and mortality in the U.S. Identifying factors that mitigate the devastating effects of acute stroke and reduce readmissions would have a large impact on patients, families, and society. Shortening time to Tissue Plasminogen Activator (tPA) administration is one factor that may improve patient outcome.

Objectives: Among acute ischemic stroke patients, examine the association between Emergency Department (ED) door to tPA (dtPA) infusion time and 30-day readmissions and mortality, using a cohort created by data linkage among the Georgia Coverdell Acute Stroke Registry (GCASR) and other Georgia databases.

Methods: A retrospective cohort of acute stroke patients receiving tPA in the ED was identified from the GCASR database (2007-2010) and linked to Georgia hospital discharge and death records using Fine-grained Record Integration and Linkage software (FRIL). FRIL resulted in a linkage between the registry and hospital discharge data with a sensitivity of 87% and positive predictive value of 96%. Once linked, variables of interest (including dtPA, readmission, mortality, age, gender, and intracranial hemorrhage) were analyzed using multivariable logistic regression.

Results: 1106 patients were available for primary outcome analysis and linkage. 149 (13.5%) died within 30 days of admission and 135 (12.2%) were readmitted within 30 days of discharge. 4.8% suffered symptomatic intracranial hemorrhage. DtPA time was not significantly associated with 30-day readmission using crude or adjusted analysis. DtPA time had some association with 30-day mortality: the continuous dtPA had and OR 1.004 (95% CI: 1-1.009), and the dtPA >90 minute group showed a significant increased odds of death (crude OR 1.585; 95% CI: 1.002-2.506).

Conclusion: Using FRIL, a new statistical linkage tool, we were able to link de-identified data and create a retrospective cohort. Door-to-tPA time was not associated with 30-day readmission in our cohort of acute stroke patients using crude or adjusted analysis. However, dtPA time was weakly associated with increased 30-day mortality in continuous analysis; and dtPA time over 90 minutes may be associated with a 58% increase in the odds of death at 30 days.

355 Is tPA Hemorrhage Rate Higher in the "Real World" Setting?

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Background: Among patients receiving tPA for treatment of acute ischemic stroke, National Institutes of Neurological Disorders and Stroke (NINDS) reported an intracerebral hemorrhage rate of 6.4%. One study by Buxton and Cookish saw a 15.6% intracerebral hemorrhage rate in patients treated with tPA at their facility and suggested that a higher rate may more likely be seen in a community setting.

Objectives: We sought to see if the hemorrhage rate at an academic institution approached the rate seen by Buxton or remained closer to the NINDS trial rate.

Methods: Retrospective chart review was conducted on patients who were treated in the Emergency Department with tPA between April 1, 2013 and November 30, 2014.

Results: 67 visits were included in the final evaluation. Median baseline NIHSS was 8 (IQR 5, 12) and average age was 67 ± 15 years. More patients were treated in the 0-3 hour window than the 3-4.5 hour window (57 vs 7), and 3 patients were treated after 4.5 hours from last known well. Absolute contraindications were identified in 20 visits with elevated blood pressure immediately prior to tPA administration or elevated PT being the most common reasons. Additionally, 19 visits had elevated blood pressure during the tPA infusion, while only 6 of those patients received antihypertensive treatment. An adverse outcome was noted in 21% of visits: 9% ICH, 12% non-ICH major bleed, and 3% minor bleed. Of the 6 patients with ICH, 3 received tPA within guideline recommendations. The other 3 had contraindications or blood pressure protocol violations. In hospital mortality was 12%.

Conclusion: A higher intracerebral hemorrhage rate of 9% was found at this institution. Hemorrhage rate was above that observed in the NINDS trial but lower than that found by Buxton. Concerning also was the 21% adverse outcomes and 12% in hospital mortality. The impact of the protocol violations discovered in this retrospective study upon post tPA adverse events is unclear. Further investigation is warranted to determine whether strict protocol adherence would have a positive influence upon the frequency of adverse events. This is especially important due to recent FDA relabeling of alteplase.

356 Implementing Two Target:Stroke Best Practice Strategies: Effects on Diagnosis and Treatment Times

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Background: In order to improve the morbidity and mortality associated with stroke, the ASA established the Target:Stroke initiative, which recommends best practice strategies to improve time to lytic therapy. Studies have shown that implementing this initiative was associated with decreased time to lytic therapy and thus mortality. However, the individual strategies have not been studied to determine which recommendations significantly decrease times.

Objectives: Two best practice strategies were targeted: 1. Activation of the stroke team (ST) at EMS pre-hospital notification (PHN) and 2. Transfer directly to CT scanner. The objective of this study is to determine if activating the ST upon receipt of the PHN by EMS significantly decreases door-to-imaging time (D2I) and door-to-needle time (D2N). Secondary objective was to determine whether transferring the patient directly to CT upon arrival further improves times.

Methods: We performed a quality improvement analysis of cases in which the ST was activated based on PHN. Six months later, a second intervention was implemented to transfer stable patients directly from ambulance to CT. If no emergent intervention was needed based on point of care glucometry and blood pressure, the patient was directly

30-day Readmission and Mortality

	Readmission				Mortality			
	Crude		Adjusted		Crude		Adjusted	
Door to tPA time	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Continuous (per min)	1.0003	0.999-1.008	1.004	0.999-1.009	1.004	1-1.009	1.005	0.999-1.012
Categorical (ref <=60 min)								
61-90 min	0.814	0.515-1.288	0.818	0.507-1.320	1.392	0.882-2.198	1.190	0.638-2.221
>90 min	0.958	0.614-1.527	1.018	0.633-1.637	1.585	1.002-2.506	1.480	0.772-2.838

Table 354: Backster.

transported to CT. Times of arrival, imaging and lytic administration were recorded for every patient. D2I and D2N were calculated for six months pre-intervention, six months after PHN, and six months after direct door to CT.

Results: Pre-intervention, the mean D2I was 23.3 minutes with 72% meeting the goal of less than 25 minutes. After PHN of the ST, D2I improved to 16.3 minutes (78% meeting goal, P<0.02, 95%CI 1.1-12.3). Transfer directly to CT again improved times to 8.4 minutes (100% meeting goal, P 0.0001, 95%CI 4.8-10.6). Pre-intervention, the mean D2N was 71.5 minutes with 50% meeting the goal of less than 60 minutes. After PHN of the ST, D2N improved to 45.6 minutes (100% meeting goal, P<0.08, 95%CI 1.1 4.3-55.9). After transferring directly to CT, D2N time was 41.4 minutes (75% meeting goal, P 0.6, 95%CI -12.64 to 21.0).

Conclusion: Both D2I and D2N were significantly improved after activating the ST based on EMS haste. D2I was even further improved and showed statistical significance if the patient was transported directly to CT scan. However, transporting the patient directly to CT scanner did not significantly improve D2N.

357 Geographic, Demographic and Socioeconomic Analysis of NIH StrokeNet Research Network Population Coverage

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Background: StrokeNet is an NIH research network created to efficiently conduct clinical trials and research studies to advance acute treatment, prevention, and recovery/rehabilitation following stroke. The external validity of StrokeNet research will be affected by the generalizability of the findings from its recruited subjects to the population in general. The time critical nature of many investigational stroke treatments and practical limits on subject travel for research purposes limit the population available for research participation.

Objectives: We characterized the adult population with geographic access to a StrokeNet acute care research site and its representativeness of the overall US population.

Methods: Administrative data on research sites was obtained from the StrokeNet National Coordinating Center and geocoded using the ESRI StreetMap dataset in ArcMAP 10.2.2 Geographic Information System (GIS) software. Ground and air-ambulance data identify transport times of 60, 90 and 120 minutes, corresponding to transport distances of 20, 40 and 65 miles, respectively. GIS software overlaid these radii with corresponding buffers on thematic maps of StrokeNet adult acute care hospitals, their referral clinics, and participating VAMC hospitals. The analysis used the US Census American Community Survey 5-year 2009-13 detailed data at the blockgroup level. Map layers were analyzed individually and in aggregate. Descriptive data presented with comparison to national averages.

Results: 281 sites were identified as of August 1, 2015. 38%, 50%, and 60% of the total US population were within 20, 40 and 65 miles of an identified StrokeNet site. Geographic coverage and analysis for gender, race, age, and income are presented below. High rates of access were identified for Hispanic/Latino, Black, and Asian populations and households with high median incomes. Limited rural access was identified. Data on rehabilitation and pediatric access to be presented.

Conclusion: Current StrokeNet sites provide geographic access to stroke treatment and prevention research opportunities for a substantial portion of the US population. The encompassed population reflects the demographic and socioeconomic makeup of the nation as a whole, providing a basis for generalizable subject recruitment.

358 Pumping Against Gravity: Cardiac Function Affects Fluctuations in Cerebral Blood Flow Caused by Head Position Change in Acute Ischemic Stroke

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Background: Acute ischemic stroke (AIS) patients often have variable head-of-bed (HOB) elevations in the ED. Flat HOB positioning may improve outcomes in large vessel occlusion. Whether this holds true in undifferentiated, ED AIS patients is unknown.

Objectives: We tested the hypothesis that 0^0 HOB positioning improves middle cerebral artery (MCA) mean flow velocity (MFV) in AIS compared to 30^0. We secondarily tested the hypothesis that lower cardiac output (CO) is associated with greater fluctuation of MFV.

Methods: This was a quasi-experimental design with repeat measurements of MCA MFV at 30^0 and 0^0 HOB position. Patients > 18 years presenting to the ED within 12 hours of symptom onset and a NIHSS ≥ 4 were eligible. Patients were excluded that could not tolerate 0^0 HOB or had absent temporal Doppler windows. After applying continuous, non-invasive monitoring of mean arterial pressure (MAP) and CO, an investigator used transcranial Doppler to obtain bilateral MCA MFV at 30^0 and 0^0 HOB position. The primary outcome was the change in MFV between these positions. The primary analysis

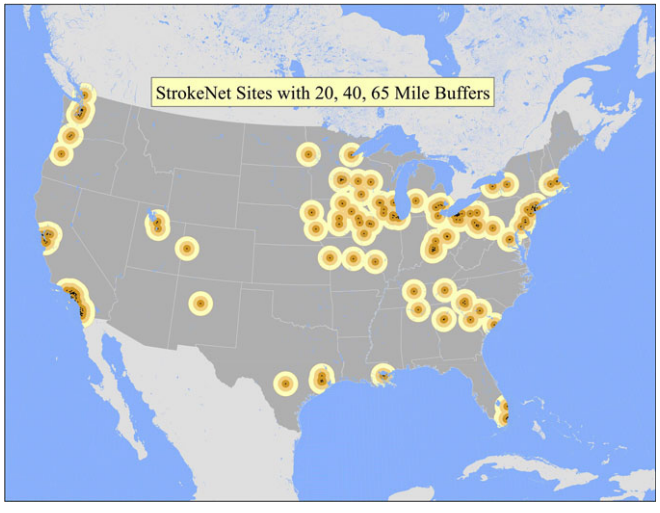

Figure 357 – Sozener

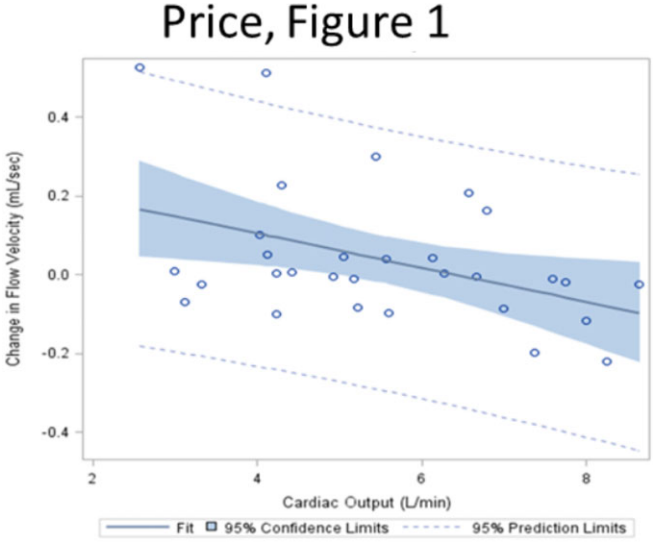

Figure 358 – Price

comprised all subjects with confirmed stroke on subsequent imaging and included t-test for continuous measures. Secondary analysis used multiple linear regression to test if baseline NIHSS, age, MAP and CO were associated with changes in MFV.

Results: There were 38 subjects enrolled, of whom 32 had confirmed AIS and were included in analysis. The mean age was 66 (±15) years and NIHSS 7 (±6). Stroke location was mixed (50% lacunar, 25% posterior and 25% anterior circulation). Averaged across all subjects, the MFV did not significantly increase when changing the HOB position from a 30^0 to 0^0 (+0.7 cm/s, 95% CI -1.6 to 3.1). Nevertheless, 16% (95% CI 5-33%) of subjects had a ≥ 20% increase in MFV at 0^0 compared to 30^0 HOB. Adjusting for age, NIHSS and MAP, lower CO was associated with greater change in MFV (+2 cm/s [95% CI 0.2-3.7 cm/s] for every 1 L/min lower cardiac output, see figure 1).

Conclusion: In conclusion, in a mixed sample of ED AIS patients, lower HOB position does not significantly impact cerebral flow on average, yet a proportion of individuals may benefit from lower HOB position. Low cardiac output may identify those that benefit most.

359 Treatment of Hyperkalemia (HK) in the ED: What is the Standard? Insights from the REVEAL-ED Trial

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Background: HK encountered in the ED is common and potentially fatal. However, delivery of standard of care is poorly understood.

Objectives: Our purpose was to explore the variability in the standard of care for HK in the ED setting.

Methods: The REVEAL-ED is an ongoing observational study enrolling 200 HK patients. At study start, a survey assessed local institutional practices. Each of 23 study sites provided details of patient demographics, usual standards of care, and thresholds for specific treatments. Descriptive results are reported.

Results: Across ED sites, ~ 19 HK patients/wk are seen. Most sites (78%) see ≥10 HK patients/wk and 17% see >50/wk. Insulin, albuterol, bicarbonate, and SPS are initiated most frequently at blood K^+ levels ≥6.0 mEq/L (table). Dialysis is routinely not administered unless K^+ levels are >6.0 or >6.5 mEq/L. The average length of stay for HK in the ED is 6h and ~2 days for those patients entering hospital.

Therapy Used in ED – Proportion of Study Sites	Potassium Threshold Levels (mEq/L) For Initiation of Therapy			
	<5.5	≥5.5	≥6.0	≥6.5
Insulin	5%	21%	74%	0%
Albuterol	6%	18%	71%	6%
Bicarbonate	6%	18%	76%	0%
SPS	16%	37%	47%	0%
Diuretics	6%	53%	35%	6%

Table 359: Peacock.

Conclusion: Results of this survey show ED HK is common. Insulin, albuterol, bicarbonate and SPS are initiated most frequently for K^+ levels >6.0 mEq/L. The ongoing REVEAL-ED observational study will provide important insights into the response to standard care therapies.

360 Does Sepsis Bundle Compliance Really Matter?

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Background: Although it has been more than 11 years since the inception of the Surviving Sepsis Campaign (SCC) guidelines, maximizing compliance with performance improvement initiatives is an ongoing challenge for many organizations. Within our large public healthcare system, efforts to comply with the MediCal 1115 sepsis waiver bundle began in 2010 with educational programs and variable process improvement projects with the overall goal of decreasing hospital mortality.

Objectives: To examine the rate of compliance with the SSC bundle and its effect on patient mortality due to severe sepsis and septic shock.

Methods: This was a multi-center, observational study that included 4,582 patients who presented to 1 of 3 academic tertiary care facilities (1399 beds) from January 2012 to December 2014. All adult patients, non-comfort care, with discharge ICD-9 codes of sepsis, severe sepsis, or septic shock were reviewed. Those meeting severe sepsis and septic shock clinical criteria were included in the data set. Bundle compliance metrics were adapted from the revised 2015 SSC 3-hour bundle set.

Results: Overall compliance with the bundle was 50.6%, with a 55.1% compliance for patients who declared in the ED and a 36.7% compliance for patients who declared in the ICU or ward ($p<0.001$). The hospital mortality rate for compliance and non-compliance in the ED was 16.3% versus 17.0% ($p=0.574$). The hospital mortality rate for compliance and non-compliance in the ICU and ward combined was 24.8% versus 26.9% ($p=0.431$). The overall rate of mortality for compliance and non-compliance in the hospital was 17.8% versus 20.1% ($p=0.045$).

Conclusion: While there was a trend toward lower mortality associated with bundle compliance, the difference was not statistically significant in the ED or inpatient setting. However, there was a statistically significant decrease in the rate of mortality associated with bundle compliance in the hospital overall. The rate of bundle compliance was lower than expected, especially in the inpatient setting. It is important to identify and address the barriers to adherence within our system. Further research is needed to assess the effect of bundle compliance on mortality.

361 Utility of Abdominal Plain Films for Non-Traumatic Abdominal Pain in Adult Emergency Department Patients

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Background: ED visits for abdominal pain have been increasing, and can represent a diagnostic dilemma as many patients are diagnosed with a non-serious illness and discharged. Most studies performed on the use of abdominal imaging were performed prior to the current ubiquitous availability of CT imaging in EDs.

Objectives: To address the utility of abdominal plain films (AXR) in the workup of non-traumatic abdominal pain.

Methods: We retrospectively reviewed the charts of adult patients presenting to the ED in two months of 2015 who had plain film or CT imaging of the abdomen. Patients were excluded for complaints of

trauma or imaging for tube placement. ED or inpatient records were reviewed to determine the final diagnosis; including return visits within 7 days after discharge. Final radiology reads were reviewed and compared to the final diagnosis, and the imaging marked abnormal (a finding leading to the final diagnosis), normal, or unrelated (a finding unrelated to the final diagnosis).

Results: 331 patients were identified and 28 patients were excluded. A total of 303 patients had 230 abdominal CTs and 96 AXR; 23 patients had both. The four most common final diagnoses overall were: abdominal pain of unknown etiology (22%), non-abdominal etiology (20%), gasteroenteritis (8%), and constipation (8%). 60% (183) of patients were discharged from the ED. 6.7% (20) patients were re-admitted within 7 days; but only 0.33% (1) resulted in a new diagnosis. [M1] Of the 96 AXR, 25% (24) were classified as abnormal, 17.7% (17) as unrelated, and 57.3% (55) as normal. Of the CTs, 61.7% (142) were classified as abnormal, 24.3% (56) as unrelated, and 13.9% (32) as normal. Of patients with AXR that did not lead to the final diagnosis (normal or unrelated) 22% had a diagnosis typically diagnosed by imaging such as perforation or diverticulitis. Of patients with normal or unrelated CTs, 2.3% (2) ended up with a diagnosis usually determined by imaging, including colitis. Thus, AXR and CTs had a false negative rate of 22% and 2.3% respectively.

Conclusion: While AXR are often thought of as cheap, quick tests to rule out more serious diagnoses, in this study there was a miss rate of 22% of serious diagnoses. The data collected suggest that in the patient with suspected intra-abdominal pathology, AXR have little utility in the modern ED.

362 Impact of an Online Education Initiative to Reduce Hemolysis in ED Lab Samples

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Background: Emergency department (ED) blood samples have a higher rate of hemolysis (6%-30%) than the 2% benchmark established by ASCP. Hemolyzed specimens may require re-drawing and re-testing, resulting in delays in treatment, delays clinical decision making, prolonged ED length of stay, and patient dissatisfaction. While the reasons for high hemolysis rates are multifactorial, they are typically caused during the pre-analytic phase of the testing process.

Objectives: The objective of this study was to determine the effect of an education initiative aimed towards optimization of a set of pre-analytic factors on hemolysis rates in ED blood samples.

Methods: This was a prospective interventional study in an urban tertiary care ED with annual volume of approximately 65,000 visits. Utilizing the Sunquest lab data platform, we evaluated all potassium lab draws during two independent periods. The historical control period represented lab draws between 8/1/14-8/23/14 and the comparative period represented draws between 8/1/15-8/23/15, after a predetermined level 85% completion rate of the online education module. The draws in 2015 followed an online education initiative given to nurses and medics in the ED to inform them of best practices in reducing hemolysis including the following: straight stick use, use of antecubital vein for IV lab draws, use of large gauge needles and tourniquet time less than 60 seconds.. We compared the overall frequency of hemolysis using Chi-square tests.

Results: The overall hemolysis rate during the control period was 11.57% (259/2238 samples). Following the intervention, hemolysis rates were significantly lower 9.68%; (221/2283, p=0.04). Hemolysis rates with comment and gross hemolysis rates were also less frequent but neither was statistically significant.

Conclusion: An online educational effort to instruct frontline staff on best practices had a significant impact on hemolysis rates. Further evaluation of the long-term effects and the specific content that was effective may be valuable in improving this practice in the ED.

363 Validation and Evaluation of Pre-Analytical Factors Associated with Hemolysis in ED Blood Samples

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Cleveland Clinic, Cleveland, OH

Background: Hemolysis of ED blood samples is a common occurrence, and has a negative impact on ED healthcare delivery. Given that in the US there are approximately 130 million ED blood draws annually, even low hemolysis rates (~2%) may have substantial impact.

Objectives: The objective of this study was to determine the effect of a set of pre-analytic factors (use of straight stick, needle gauge, location of blood draw, syringe vs vacuum tube use, tourniquet time) on hemolysis rates in ED blood samples.

Methods: This was a retrospective review of consecutive ED blood samples obtained in an ED with census of 60,000. The hospital EMR was queried for potassium (K) blood results and blood draw technique for all samples obtained between January and December of 2014. Baseline hemolysis rates were determined with hemolyzed K measured by hemolysis index and reported out as hemolyzed specimens. Proportions with p values are reported.

Results: Overall hemolysis rates were 10.0% [5439/54531]. Hemolysis among samples obtained from straight stick was significantly less (5.4% [33/615]) than those obtained with IV (10.2% [4821/47266], p<0.001). For IV-placed blood draws, antecubital location had a statistically significant lower overall hemolysis rates when compared to other locations: 6.2% [1176/28786] vs 11.3% [2025/17960], p<0.001. For large gauge IV blood draws (16-20 gauge) vs. smaller gauge IVs, a lower hemolysis rate was also observed (9.3% [3882/41567] vs. 16.5%[939/5699]), p<0.001. For IV drawn blood with Tourniquet times <60 sec, hemolysis was 10.3% [1362/13162] vs. for >60 sec, 13.9% [532/3832], p<0.001. For blood drawn with a Syringe hemolysis rates were 13.0%[1820/16590] vs. vacuum 11.0%[92/705] (not statistically significant, p=0.09).

Conclusion: This study confirmed previous findings (Heyer et al.) that straight stick and antecubital location are significantly associated with reduced rates of hemolysis. In addition, our findings indicated that shorter tourniquet time and larger gauge among IV draws were significantly associated with lower hemolysis. There was no association found between syringe versus vacuum tube in regards to hemolysis rates.

364 Hepatitis C Virus Screening Does Not Increase Emergency Department Length of Stay for Patients Undergoing Laboratory Testing

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Background: Emergency departments (ED) must consider whether the public health benefit of screening for diseases such as HIV and hepatitis C virus (HCV) justifies the impact on quality metrics, such as length of stay (LOS). In April 2014 we integrated triage nurse HCV screening into ED clinical operations, utilizing a laboratory-based testing protocol and native staffing to offer, perform, and disclose results. Because of concerns that HCV screening would increase ED LOS, our protocol did not require patients to wait for their HCV test results prior to discharge.

Objectives: The objective of this study was to assess the impact of this integrated HCV screening protocol on ED LOS.

Methods: In this retrospective cohort study we analyzed prospectively collected timestamp data for all discharged patients over a

1-year period. The primary outcome compared the median LOS in minutes between patients who completed HCV screening and those who did not. Further analysis compared LOS for HCV screening by whether or not complete blood count (CBC) testing was completed.

Results: Of 69,639 visits, 2,864 (4%) had HCV screening tests completed and 272 (9.5%) were antibody positive. The LOS for visits that included HCV screening was greater than the LOS for visits that did not include screening (151 versus 119 minutes, P < 0.001). Among the subset of visits in which no CBC testing was performed, the LOS was greater for visits that included HCV screening compared with those that did not include screening (86 versus 77 minutes, P < 0.001). Among the subset of visits in which CBC testing was performed, however, there was no significant difference in LOS between visits that also included HCV screening and those that did not include screening (240 versus 242 minutes, P = 0.68).

Conclusion: Integrated HCV screening modestly prolongs overall ED LOS. However, among patients undergoing other blood tests, HCV screening had no effect on LOS. Future programs may consider routinely offering HCV screening to patients who are otherwise undergoing laboratory testing.

365 External Validation of the Hestia Criteria for Identifying Acute Pulmonary Embolism Patients at Low-Risk of Early Mortality

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Background: The derivation study of the 11 Hestia criteria demonstrated they had a high sensitivity and negative predictive value for identifying pulmonary embolism (PE) patients at low-risk for early mortality. To date, a paucity of studies externally validating the Hestia criteria have been published.

Objectives: To externally validate the Hestia criteria for predicting in-hospital and 30-day post-PE mortality.

Methods: We retrospectively identified consecutive, adult, objectively-confirmed (according to clinical guidelines) PE patients presenting to the emergency department at our institution between November 11, 2010 and January 31, 2014. Risk stratification of patients with acute PE using the Hestia criteria were performed according to published methods. We ascertained the total number of Hestia criteria met for each patient, calculated the proportion of patients categorized as low-risk (no Hestia criteria met) and determined the accuracy of the Hestia criteria for predicting in-hospital and 30-day all-cause mortality by evaluating sensitivity, specificity, negative and positive predictive values and the c-statistic. Mortality status was determined based upon searches of the Social Security Death Index.

Results: A total of 577 PE patients were included, of which 19 (3.3%) and 35 (6.1%) died in-hospital or within 30-days of presentation (**see Weeda Table 1**). Both in-hospital and 30-day case fatality rates rose as the number of Hestia criteria increased. One hundred and forty-nine (25.8%) patients were classified as low-risk for early mortality and none of these patients died within 30-days (negative predictive values=100% for both mortality time points). The Hestia criteria had excellent sensitivity (100% and 100%) but lower specificity (26.7% and 27.5%) for predicting in-hospital and 30-day mortality. Positive predictive values for the Hestia criteria were low (<8.2% for both mortality time points). The c-statistics for in-hospital and 30-day mortality derived from Hestia risk category distributions were 83.5% and 78.5%.

Conclusion: The Hestia criteria have an acceptable predictive accuracy to identify patients with PE at low-risk for early mortality. Additional external validation studies of the Hestia criteria should be performed.

Hestia Risk Categories	Patients (n=577) % (95%CI)	In-Hospital Mortality (n=19) % (95%CI)	30-Day Mortality (n=35) % (95%CI)
0	25.8 (22.4-29.6)	0 (0-2.5)	0 (0-2.5)
1	36.2 (32.4-40.2)	0.5 (0.08-2.6)	3.2 (1.6-6.5)
2	19.9 (16.9-23.4)	6.3 (3.2-11.9)	9.5 (5.5-15.8)
3	6.8 (5.0-9.1)	10.6 (4.6-22.6)	17.0 (8.9-30.1)
4-6	5.2 (3.7-7.3)	13.2 (5.8-27.3)	21.1 (11.1-36.4)
Low	25.8 (22.4-29.6)	0 (0-2.5)	0 (0-2.5)
High	74.2 (70.5-77.6)	4.4 (2.9-6.8)	8.2 (5.9-11.2)
Test Characteristics			
Prevalence	---	3.3 (2.1-5.1)	6.1 (4.4-8.3)
Sensitivity	---	100 (79.1-100)	100 (87.7-100)
Specificity	---	26.7 (23.1-30.6)	27.5 (23.8-31.5)
Negative predictive value	---	100 (96.9-100)	100 (96.9-100)
Positive predictive value	---	4.4 (2.8-7.0)	8.2 (5.8-11.3)
C-statistic	---	83.5 (77.1-89.9)	78.5 (71.9-85.1)

Weeda Table 1. Prevalence of In-Hospital and 30-Day Mortality Within Risk Strata and Predictive Accuracy of the Hestia Criteria

Table 365: Weeda.

366 Pleuritic Chest Pain Independently Predicts Diagnosis of Pulmonary Embolism Among ED Patients with Chest Pain

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Background: Obtaining a history of pleuritic chest pain is a common consideration when assessing a patient's risk of pulmonary embolism (PE). However, validated PE risk assessment tools do not utilize this historical characteristic.

Objectives: We evaluated whether pleuritic chest pain predicts the diagnosis of PE among patients presenting to the emergency department (ED) with chest pain.

Methods: We prospectively enrolled a convenience sample of patients with chest pain in an urban, academic ED. We recorded baseline characteristics and outcomes of testing during the ED stay. We calculated pulmonary embolism rule-out criteria (PERC) using baseline variables. We performed multivariate analysis utilizing ten variables: pleuritic chest pain, syncope, hemoptysis, calf pain/swelling, surgery in the past four weeks, immobilization greater than four days, exogenous hormone use, heart rate ≥100, oxygen saturation <95%, and previous PE or deep vein thrombosis. The primary study outcome was PE diagnosed via computed tomography (CT) during the ED stay.

Results: Over the 3.5-year study period, 1990 ED patients presenting with chest pain agreed to participate in the study. 49.4% of patients described their chest pain as worse when taking a deep breath (pleuritic). Patients with pleuritic chest pain were more likely to be diagnosed with PE during the ED stay (2.3% vs. 0.8%, p=0.005). Among those who reported chest pain without shortness of breath, this relationship was pronounced (pleuritic chest pain: 3.7% vs. non-pleuritic chest pain: 0.6%, p=0.014). For patients who were PERC positive, those with pleuritic chest pain were at higher risk of PE: 2.8% vs. 1% (p=0.005). Independent predictors of PE were pleuritic chest pain [odds ratio (OR): 2.70, 95% confidence interval (CI): 1.18-6.14] and exogenous hormone use (OR: 3.03, 95% CI: 1.39-6.60).

Conclusion: Among patients with chest pain, a description of pleuritic pain independently predicted the diagnosis of PE during the ED visit. Additionally, those who were PERC positive and had pleuritic chest pain were at increased risk of PE. This history may be considered to strengthen existing scoring systems.

367 Age-Adjusted Turbidimetric D-Dimer for Evaluating Pulmonary Embolism

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Background: Background Prior studies describing the use of D-dimer for diagnosis of pulmonary embolism (PE) have focused on ELISA assays. Turbidimetric D-dimer immunoassays are also commonly used, but data validating an age-adjusted cut-off are lacking.

Objectives: Objective: To describe the performance characteristics of the HemosIL™ D-Dimer HS turbidimetric immunoassay for ruling out PE at the standard threshold, doubled threshold, and age-adjusted threshold.

Methods: Methods A retrospective cohort study set in a high-volume urban ED of all patients who had a D-dimer value tested in the ED (HemosIL ™ D-dimer HS Assay) between January 2008 and June 2015. Demographics, laboratory data, and diagnosis of PE were taken directly from the electronic medical record. All CT pulmonary angiogram (CTPE) results were reviewed by trained abstractors. All charts where CTPE read did not match the final diagnosis were reviewed manually by two abstractors, as were the charts of patients diagnosed with a PE without a CTPE study. The negative likelihood ratio (NLR) of the D-dimer assay for ruling out PE was compared at a standard threshold (229 ng/mL), doubled threshold (458 ng/mL), and age-adjusted threshold with an age-multiplier adjusted for the lower threshold of our assay (4.58 x age in patients over 50 years).

Results: Results A total of 10,597 patients were included, of which 60% were women and 40% men. The mean age was 44, and the rate of PE discovered by CT scan was 2.1%. Over the age of 50, the 229 ng/mL cutoff missed 1 case of PE compared to 4 missed at the age-adjusted cutoff, resulting in a nLR of 0.02 (95% CI: 0.00-0.14) and 0.07 (95% CI: 0.03-0.17), respectively. Test characteristics for the doubled threshold were not favorable. See Table.

Conclusion: Conclusion Compared to the 229 ng/mL cut-off recommended by HemosIL™, an age-adjusted cutoff performed comparably with acceptable negative likelihood ratios, suggesting that adjusting for age is also acceptable with this assay. The doubled threshold, however, performed poorly.

	Age	All (n=10,597)	≤50 (n=6,884)	≥51 (n=3,717)
Conventional	DD-/N total (%)	60	66	49
	nLR (95% CI)	0.04 (0.02-0.10)	0.06 (0.03-0.15)	0.02 (0.0-0.14)
	FNR (%)	0.05	0.07	0.02
	NNT	1.7	1.5	2.1
Doubling threshold	DD-/N total (%)	81	85	73
	nLR (95% CI)	0.26 (0.20-0.33)	0.32 (0.24-0.43)	0.19 (0.12-0.31)
	FNR (%)	0.44	0.46	0.40
	NNT	1.2	1.2	1.4
Age-adjusted	DD-/N total (%)	63	66	57
	nLR (95% CI)	0.06 (0.03-0.12)	0.06 (0.03-0.15)	0.07 (0.03-0.17)
	FNR (%)	0.08	0.07	0.10
	NNT	1.6	1.5	1.8

DD-: negative d-dimer
nLR: negative likelihood ratio
FNR: false negative rate
NNT: number needed to test

Figure 367 – Gadbois

368 Intubation Rates for Adult Patients Ages 22-64 Have Not Changed from 1999-2014: A Multicenter Study

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Background: In a previous investigation, we found that the percentage of elderly patients intubated in the ED had a relative decline of 30% from 2000-2011. The three most common specific diagnoses associated with intubation were cardiac arrest, congestive heart failure (CHF) and pneumonia. We speculated that our findings over that time period reflected increased use of advanced directives for older patients and better treatment modalities for severe respiratory distress such as non-invasive ventilatory management (NIVM).

Objectives: We hypothesized that we would observe a similar trend for decreased intubation in the non-geriatric, adult population.

Methods: Design: Retrospective cohort. Setting: Consecutive ED patients in nine NJ hospitals (1/1/1999 to 12/31/2014). Protocol: We identified patients intubated in the ED by current procedural technology (CPT) intubation codes. Data Analysis: We calculated the annual percentage of patients 22-64 years old who were intubated and the percentage intubated by primary diagnosis for the top three diagnoses. We computed the linear regression coefficient (R squared) of the annual percent intubations versus year.

Results: Of the 5,661,276 patients in the database there were 3,021,291 visits for patients ages 22-64. Of these 3699 (0.12%) were intubated. The average age was 51+/-11 years; 41% were female. In the years 1999-2014 the percent intubated was the same, 0.12%. The three most common specific diagnoses for intubated patients were cardiac arrest, respiratory failure and altered mental status, accounting for 30% of total intubations. The percent intubated for these three changed little from 1999-2014. As shown in the figure, the R squared of the percent intubations versus year was 0.24, which was not statistically significant (p=0.35).

Conclusion: Intubation rates for patients ages 22-64 did not decline during the period 1999 to 2014 in our multicenter cohort. We speculate that the results in this age group differ from our observations for the elderly because of the absence of advanced directives and less benefit of NIVM in the most common illnesses associated with intubation in this age group.

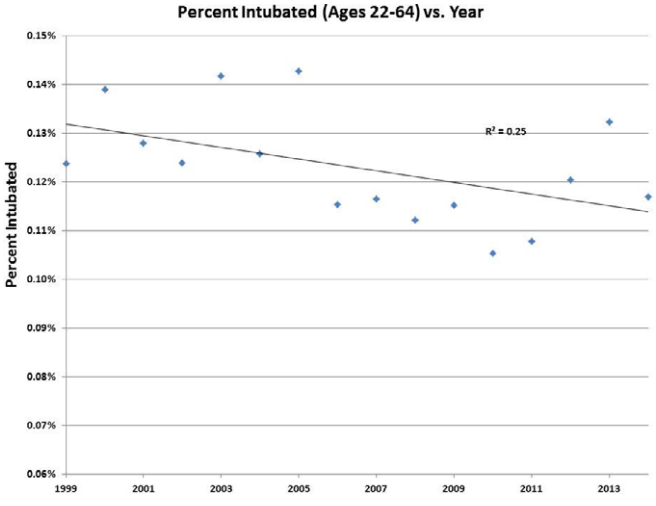

Figure 368 – Nguyen

369 Cost of Hypoglycemia Associated with Diabetes Mellitus: A Systematic Review of the Literature

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Background: Diabetes mellitus (DM) is an important chronic disease. Many patients with DM suffer hypoglycemic episodes that may be mild, moderate or severe, requiring ambulance and emergency department (ED) services. The cost of these DM-associated hypoglycemic episodes in the ED is not well understood.

Objectives: The objective was to review literature on DM-associated hypoglycemia costs that were incurred in acute care settings, with particular interest in the ED setting.

Methods: The methods of this systematic review were based on an a priori protocol. The literature searches involved 12 databases. Study selection and quality assessment were conducted independently by two reviewers. Costs from included studies were standardized to year 2014 Canadian dollars. Mean with standard deviation (SD) and median costs with interquartile range (IQR) were calculated whenever possible.

Results: The systematic search yielded 1,164 studies and 62 were included. The largest proportion of studies (45%) originated from USA data. Quality of included studies varied widely. Although none of the studies were purely a cost analysis of DM-associated hypoglycemia in the ED, 15 studies reported some ED costs. Median DM-associated hypoglycemic episode costs were $1,187.15 in the ED and $1,288.92 irrespective of setting. More severe episodes were more costly; costs were 8.5 times higher in the inpatient setting than in the ED. Episode costs were 18-45% higher for patients with Type 2 DM than Type 1. Direct costs comprised 80% of total costs.

Conclusion: Acute episodes of DM-associated hypoglycemia are costly. These episodes also often require hospitalization; the highest costs are incurred by admitted patients with Type 2 DM. More studies are needed to better understand the costs associated with ED use by patients with DM-associated hypoglycemia. PROSPERO registration number: CRD42015017268.

370 Test Characteristics of Emergency Ultrasound for Detection of Fractures in Small Bones Using a Novel Avian Model

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Background: Emergency Ultrasound (EUS) for diagnosing fractures at the bedside has been proposed for more than a decade but has not been widely adopted due to uncertainty of its accuracy.

Objectives: The purpose of this blinded experimental study is to determine the test characteristics of EUS when used by inexperienced residents in a novel chicken drumstick model. This particular model was chosen to approximate typical fractures seen clinically in injuries of the phalanges, metacarpals and metatarsals and pediatric fractures including ribs.

Methods: 20 uncooked fresh chicken drumsticks with a mean bone diameter of 2cm were randomized such that one group had minimally displaced fractures (11/20) experimentally induced and the other group had no fracture induced but did have visible soft tissue trauma (9/20). 20 PGY 1-3 Emergency Medicine residents scanned each of the drumsticks and recorded their interpretation as "Fracture" or "No Fracture" along with a rating of their certainty of diagnosis on the 1-5 Likert scale ranging from "Very Uncertain" to "Very Certain". There were a total of 400 scans. All scanning was performed in a single session. Each operator scanned all 20 drumsticks using a high frequency linear array probe. We calculated the overall sensitivity and specificity of the technique and compared the accuracy between the junior (PGY 1) and senior (PGY 2 or 3) residents.

Results: The residents had a median sensitivity of 82% (interquartile range = 64% to 91%) for detecting fracture while the median specificity was 78% (interquartile range = 67% to 100%). There was no significant difference in sensitivity ($p = 0.44$) or specificity ($p = 0.97$) between the junior and senior residents. The accuracy of determining fracture status was 64% with low certainty scores of 1 or 2, and increased to 85% with high certainty scores of 4 or 5.

Conclusion: Residents as a group had only modest sensitivity and specificity for detecting minimally displaced small bone fractures, although 7 out of 20 residents correctly categorized at least 90% of the drumsticks as to presence or absence of fracture. Higher ratings of user confidence appear to be associated with greater imaging accuracy.

371 The Clinical Utility of Routine Chest X-Rays During the Initial Stabilization of Trauma Patients: A Retrospective Study

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Background: The Advanced Trauma Life Support (ATLS) course recommends the use of chest x-ray (CXR) to identify injuries that may change clinical management of the trauma patient. Prior studies question the utility of routinely performing CXR during the initial stabilization of trauma patients.

Objectives: We intend to determine the incidence of clinically significant findings on initial portable chest x-rays (pCXR) performed during the initial stabilization of the trauma patient.

Methods: In this retrospective study, we identified all patients who received a one-view pCXR as part of their initial evaluation in the trauma room of a Level 1 trauma center during a 2 year period. From 2011 to 2012, 2101 trauma patients were admitted to the emergency department (ED); 400 were randomly selected for possible inclusion into our study group. The pCXR reports were reviewed and a chart review was performed on those with abnormal findings to evaluate for predetermined interventions occurring after the pCXR but prior to computed tomography (CT) imaging, transfer to the operating room, or death; which ever came first. Our data was analyzed with standard descriptive statistics.

Results: Of the 400 selected patient encounters, thirty-eight patients (9.5%) demonstrated findings of traumatic injuries on pCXR. Identified injuries included four pneumothoraces, three clavicle fractures, three rib fractures, one pulmonary contusion, and one thoracic spine fracture. Of those with positive findings on chest x-ray, no immediate clinical interventions occurred during the predetermined time frame.

Conclusion: This data does not support the routine use of pCXR during the initial stabilization of trauma patients. A more clinically-driven approach may reduce utilization.

372 Early Child Care Biosurveillance is Equivalent to Google Flu Trends for Prediction of Influenza in Michigan

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Background: Biosurveillance is a critical tool in early disease outbreak detection. Schools do not routinely include data from early child care (ECC) when reporting influenza-like illness to the state. How our web-based disease surveillance system (sickchildcare.org) using real-time child care provider generated reports to track illness among infant to preschool-aged children in ECC compared to Google Flu Trends (GFT), using the state web-based disease reporting system (Michigan Disease Surveillance System-MDSS) as the gold standard, is unclear.

Objectives: To compare two web-based methodologies of biosurveillance - Internet search-based Google Flu Trends (GFT) and ECC-based sickchildcare.org in Washtenaw County, Michigan against the flu database MDSS.

Methods: Sickchildcare.org was implemented in four child care/preschool centers (~150 children per center) in December, 2013 and then expanded by five additional centers in October, 2014 (~180 children per center) from a single county. Rates of reported flu-like illness from 12/2013 to 05/2015 were collected weekly. GFT 2014 prediction algorithm was used to generate weekly rates of flu-like illness in

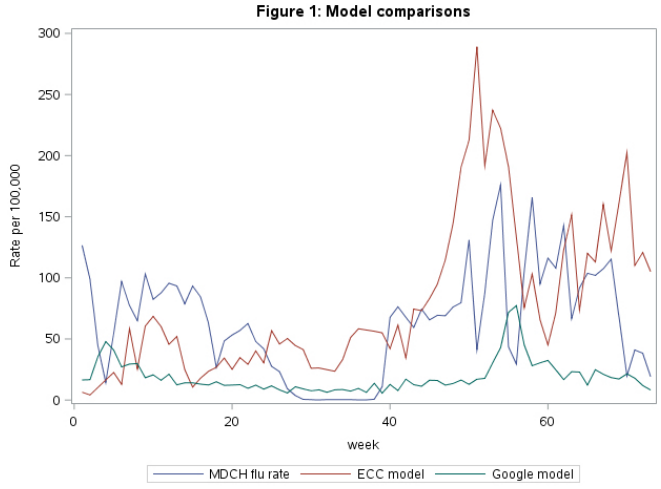

Figure 372 – Wang

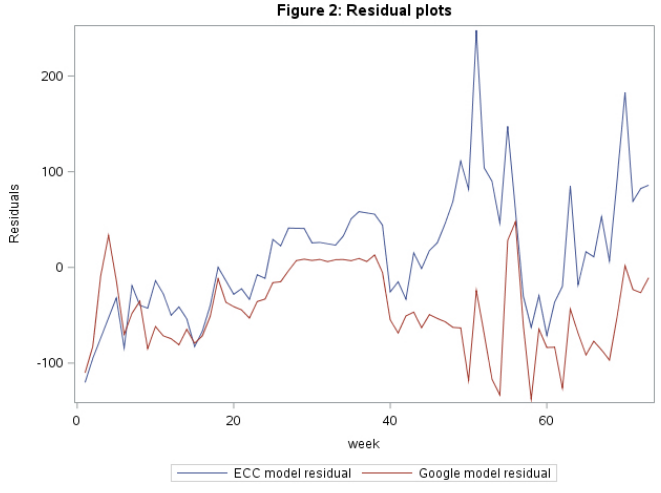

Figure 372 – Wang

Michigan. Total reported flu-like cases were collected from the MDSS. SAS statistical software was used to generate time-lagged regression models using both ECC and GFT data.

Results: The ECC data generated a sixth order model with a total R-squared of 0.6290 while the Google data generated a third order model with a total R-square of 0.9010. When compared against MDSS data, the ECC model is prone to overestimate whereas the GFT model is prone to underestimate. (Figure 1). Calculating the sum of residual squares in ECC vs MDSS and GFT vs MDSS shows that the two models have equivalent fit, at 260,000 (ECC) vs 268,000 (Google) (Figure 2).

Conclusion: Outbreaks of influenza-like illnesses in Michigan are equally accurately modeled by extrapolation of a web-based ECC illness reporting system other than GFT. With GFT no longer publishing estimates, biosurveillance using ECC represents a feasible method for tracking and modeling disease activity regionally.

373 Low-Risk Febrile Neutropenia: Can These Patients be Safely Discharged from the Emergency Department?

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Background: Febrile neutropenia has the potential for significant morbidity and mortality. There may, however, be a low risk cohort that can be safely discharged from the ED with oral antibiotics and close follow-up. Previously developed decision rules for febrile neutropenia risk stratification, such as the MASCC (Multinational Association for Supportive Care in Cancer) and CISNE (Clinical Index of Stable Febrile Neutropenia) scores have been successfully validated for use in the oncology clinic setting. Unfortunately, there is a dearth of research evaluating these scores in the ED.

Objectives: To compare the predictive accuracy of both the MASCC and CISNE scores for all patients with febrile neutropenia presenting to the ED.

Methods: We conducted a retrospective cohort study to evaluate all patients with febrile neutropenia (temp≥38°C, ANC<1000) who presented to two academic EDs from June 2012 through January 2015. Both MASCC and CISNE scores were calculated for all study subjects and each visit was evaluated for several outcome variables including length of stay (LOS), upgrade in level of care, clinical deterioration, positive blood cultures, and death. Continuous variables were analyzed using the Wilcoxon rank sum test.

Results: During our study period 247 patients presented to the study EDs with febrile neutropenia. The CISNE score more appropriately identified a low risk group (n=53, 21.4%) in all of our outcome variables including positive blood cultures (n=1, 97.4% sensitivity), upgrade (100%), clinical deterioration (100%), death (100%) and a pooled outcome variable that included all previous measures (98.4% sensitive, NPV 98.1%). Mean LOS was significantly shorter for low risk CISNE patients (4.5 day mean difference, p= <.001). The MASCC score did not appropriately risk stratify febrile neutropenia patients in our ED study, with a sensitivity of only 57% for our pooled outcome.

Conclusion: The CISNE score was highly sensitive for those variables assessed in our study. In contrast, the MASCC score did not appropriately risk stratify, likely due to the subjective measure of patient symptoms. Our results suggest that the CISNE score may be an appropriate risk stratification tool to assist in the safe discharge of low risk febrile neutropenic patients from the ED.

374 Can We Predict Severe Sepsis Outcomes Utilizing Shock Index?

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Background: The shock index (SI), heart rate/systolic blood pressure, has previously been used in trauma patients to predict severity of illness. More recently the SI has been reported to predict elevated lactate and mortality in patients with severe sepsis/septic shock (SS/SS). Due to its ease of acquisition, SI has the potential to become the ideal real-time prognosticator for SS/SS patients both within the emergency department and on the wards.

Objectives: Our objectives were to evaluate the initial SI's ability to predict in-house mortality and/or hyperlactatemia among all SS/SS patients within our three hospital system.

Methods: We conducted a retrospective review of our SS/SS data from Jan 1st, 2015 to Jun 30th, 2015 utilizing an automated data aggregator built within our electronic medical record. This data-set provides quality assurance information regarding SS/SS patients across three hospitals within our health system, one large academic center and two community hospitals totaling 240,000 ED visits annually. Our review consisted of five main variables: 1) SI at 1.0 (SIHI), 2) SI at 0.7 (SILO), 3) Lactate at 4.0 (LAHI), 4) Lactate at 2.2 (LALO) and 5) In-house mortality. Our primary outcome measure was the ability of the SIHI and SILO to predict in-house mortality. Our secondary outcomes were the ability of SIHI and SILO to predict LALO and LHI across all four permutations. The data was analyzed using descriptive statistics, 2x2 tables were created to assess for significance using Fisher's Exact test.

Results: A total of 547 SS/SS patients presented to all three hospitals during the study period of whom 99 (18.1%) expired. Neither SIHI nor SILO were able to predict in-house mortality within our cohort, p= 0.805 and p = 0.907 respectively (See Table #1). However, SIHI was

SIHI and SILO vs Mortality			
	Alive	Expired	Total
=< SILO	124	29	153
> SILO	324	70	394
=< SIHI	293	66	359
> SIHI	155	33	188

Table 374: Bastani.

correlated with LAHI ($p = 0.003$) and LALO ($p < 0.001$). SILO was also correlated with LAHI and LALO with $p < 0.001$ for both calculations.

Conclusion: Within our three hospital cohort of SS/SS patients, the SI was not predictive of in-house mortality. However, SI did correlate with hyperlactatemia, which may make it a valuable marker of sepsis severity, particularly during the screening process.

375 Sepsis Mortality: Sensitivities of EWS, AOD and Lactate

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Background: Sepsis is a treacherously dynamic process, prone to abrupt clinical deterioration. The Modified Early Warning Score (EWS) has come into recent use as a means of detecting early signs of severe sepsis. EWS combines SIRS criteria with non-laboratory indications of possible acute organ dysfunction (AOD), i.e. blood pressure and mental status change.

Objectives: We examine sensitivity for sepsis mortality of EWS, compared to AOD and initial lactate levels.

Methods: This is a case control review of patients admitted through the ED of a tertiary care center who died with primary admitting diagnosis of infection during a 14-month period. Sensitivities for death were calculated for EWS, AOD and lactate. Initial EWS was compared to final EWS prior to admission. R2 values are compared.

Results: 49 patients with sepsis were admitted and died. 6/49 had low EWS (less than 5). Of those with high EWS (6 or greater), 24/49 showed improved scores while in the ED. 15/49 patients had AOD score of less than 2, 7 of whom had a score of 0. 4/49 patients had lactate level initially less than 2. There was severe inconsistency in comparing one score to another, with lactate vs EWS showing an R2 of 0.0908 and lactate vs AOD an R2 of 0.0444. With EWS incorporating aspects of AOD, the R2 was insignificantly higher at 0.1541.

Conclusion: Sensitivity for predicting sepsis mortality was best with lactate >2 at 92%. For EWS, initial score of >5 was 88%. 7 patients had AOD of 0, suggesting 86% sensitivity. These results are not inconsistent with the well-known propensity of sepsis for sudden deterioration, but confirm that none of these scores is totally reliable. Of concern, nearly half of subsequent deaths showed significantly improving EWS while in the ED. Lactate levels were not trended in this study, but initial lactate appears to be the most sensitive predictor of mortality.

376 SAA Domain-Specific Peptide Antagonists Rescue Mice from Lethal Sepsis

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Background: Sepsis remains the most common cause of death in the ICU, and its pathogenesis is partly attributable to dysregulated inflammatory responses that are amplified by proinflammatory mediators such as the high mobility group box-1 (HMGB1) and serum amyloid A (SAA) proteins. Unlike the most abundant SAA1 isoform, SAA is only detected in a subset of septic patients, but contributes to HMGB1 release and lethal sepsis. SAA protein carries several distinct functional domains respectively for binding to: 1) high density lipoproteins (HDL); 2) extracellular matrix (via the RGN fibronectin-related motif); and 3) cell surface receptors (e.g., TLR2, TLR4, or RAGE). It was previously unknown whether it would be possible to develop SAA domain-specific peptide antagonists for sepsis.

Objectives: To test this possibility, we synthesized a panel of peptides (6-mer) corresponding to human or murine SAA amino acid sequence, and examined their efficacy in a clinically relevant animal model of sepsis.

Methods: Male Balb/C mice (20-25 g, 6-7 wk) were subjected to lethal sepsis by cecal ligation and puncture (CLP) procedure, and various SAA-derived peptides (30 mg/kg) were intraperitoneally injected into animals at 20 and 48 h post CLP to evaluate the long-term (>2 wk) effect on animal survival.

Results: Consistent with our recent findings that the neutralizing antibodies targeting a specific SAA domain (KEANWKNSDKYFHARGNY) conferred protection against sepsis, several overlapping peptides (e.g., KEANWK, NWKNSD, KYFHAR, or HARGNY) also significantly increased animal survival rates (from 50% in saline group, to 70-75% in peptide treatment group, N = 20 mice/group, $P < 0.05$). In a sharp contrast, similar peptides corresponding to human SAA sequence (e.g., REANYI and NYIGSD) did not affect animal survival (45-50%, N = 20 mice/group).

Conclusion: It is possible to develop SAA domain-specific peptide antagonists to rescue animals from lethal sepsis, warranting future investigation in clinical setting.

377 The Utilization of Narcotic Analgesia in the Treatment of Migraine Headaches

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Background: There remains an inconsistent approach to the most effective and efficient management of patients who present to the Emergency Department with an acute migraine headache. Treatment is often based on a combination of provider and patient preference, hospital formulary, and expert opinion rather than an evidence based algorithm.

Objectives: The objective of this study is to examine the frequency of the utilization of narcotic analgesics as the treatment for the acute migraine headache in an academic medical emergency department (ED) and to compare the length of stay and costs associated with narcotic verses non-narcotic treatments.

Methods: Electronic health records were reviewed over the course of one year (January—December 2013) for all patients who were treated for an acute migraine headache (identified by chief complaint and ICD9 codes) with parenteral medications for 421 subjects with 521 records.

Results: 134 of the 421 patients (32%) were administered one or more narcotic medications. There were no significant age, gender, or race differences among those administered narcotics versus those not administered narcotics. The group that was administered narcotics had a statistically significant longer length of stay (mean time 5:03 vs 4:06

Outcome Comparisons for Treatment Groups			
Study Characteristic	Opioid Treatment (% of total)	Non-opioid Treatment (% of total)	p Value
Number of patients	134 (32)	287 (68)	
Total cost	$2363.62	$4528.83	<0.001
Medication cost	$34.10	$59.26	0.02
Length of stay, min	303	246	0.0002

Table 377: Berberian.

minutes, P=0.001) but lower total ED charges (mean cost $2363.62 vs $4528.82, P =0.00008) than the group that did not receive narcotic analgesia. The most frequently administered medications were anti-emetics (92%), anti-histamines (70%) and non-steroidal anti-inflammatory medications (62%).

Conclusion: Utilization of narcotic analgesia in the treatment of an acute migraine headache in the ED is associated with a longer length of stay when compared with non-narcotic medications, but at a lower cost.

378 Multicenter Prevalence of Opiate Medication Use as Abortive Therapy in the Emergency Department Treatment of Migraine Headaches

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Background: Migraine headaches account for over 1 million ED visits in the US each year. NSAIDS, antiemetics, and triptans are mainstays of abortive therapy. Opiates are not recommended and have well documented unfavorable effects. The use of opiates in this setting has been reported to still be common practice.

Objectives: This goal of this study was to describe provider treatment practices of migraines in the ED. Opiate prescribing practices during these visits were examined in three different settings: an academic medical center, a non-academic urban ED, and a smaller community ED. Throughput measures during these visits were also compared.

Methods: This was an observational study of all migraine visits over 1 year at three Connecticut EDs. Patients were selected according to primary and secondary diagnosis codes. All medications ordered were separated into first line medications, those given in the first hour, and rescue medications, those given after the first hour. Number of visits, length of stay, door to provider time, and total provider time were compared between visits with opiate administration and those without.

Results: A total of 1,222 visits were included. In all, 35.8% of visits had opiates ordered: 12.3% in the academic medical center, 40.9% in the urban ED, and 68.6% in the community ED. Usage of opiates ranged from 6.9% of all first-line therapies in the academic medical center to 69.9% of all rescue therapies in the community ED (see Figure 1). Of those who received opiates, 36.0% required rescue medications versus 25.1% (p<.001) in the standard therapy group. Patients who received opiates had a higher number of visits, 3.63 versus 1.57 (p<.001). Length of stay was not significantly different between these groups, but total provider time was greater in the opiate group, 136.5 versus 123 minutes (p=0.08).

Conclusion: Despite widespread recommendations and evidence against opiates for migraine headaches, over one third of patients received them. There was a higher prevalence in the community setting. Among patients that received opiates, there were no benefits in throughput time. Patients who received opiates required more rescue medications, had more repeat visits, and had longer total provider times.

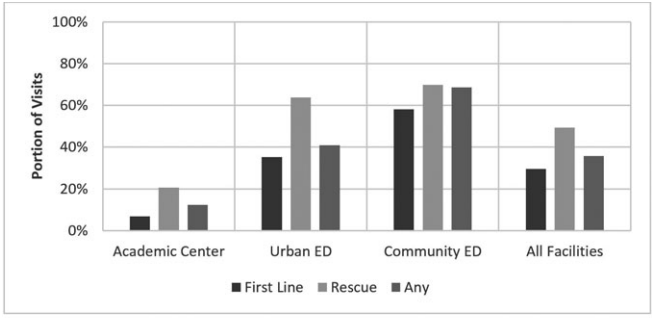

Figure 1: Migraine Visits that Received Opiate Medication as First Line, Rescue, or at Any Time

Figure 378 – Young

379 The Utility of Serum Biomarkers in the Stratification of Mild Traumatic Brain Injury

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Background: An estimated 2.5 million traumatic brain injuries (TBIs) occur in the United States annually. Mild traumatic brain injury (mTBI) accounts for the majority of TBI. There is no single accepted test for determining severity of mTBI.

Objectives: To evaluate the test characteristics of a single serum concentration of UCH-L1 and S-100B (within 6 hours of head injury) to stratify head-injured subjects into three groups: complicated mTBI, uncomplicated mTBI, and no mTBI.

Methods: Adults aged 18-80 with GCS 9-15 who presented to one of seven EDs with a blunt closed head injury, underwent head CT within 4 hours of injury, and had blood drawn for biomarker analysis within 6 hours of injury were eligible. Subjects were considered to have mTBI if they had an initial GCS ≥ 13 and met one or more of the following criteria: loss of consciousness (LOC), post-traumatic amnesia (PTA), or confusion in the ED. Subjects with mTBI and an abnormal head CT were categorized as complicated mTBI; those with a normal CT had uncomplicated mTBI; and subjects with a GCS=15, no LOC, no PTA, and no confusion were considered to not have mTBI. Chi-square, Kruskal-Wallace, and Wilcoxon were used to compare groups. The lower limit of detection was 10 pg/mL for UCH-L1 and 5 pg/mL for S-100B.

Results: The mean age of the study population was 45.8 (SD 17.3) years, and 59.9% were male. Of 247 subjects enrolled, 188 met criteria

Schloemann Table 1: Patient characteristics and median serum biomarker concentrations (IQR).

	No mTBI (N=59)	Uncomplicated mTBI (N=154)	Complicated mTBI (N=34)	3 group p-value	No mTBI vs Uncomplicated mTBI p-value
Age (SD)	49.6 (19.2)	42.5 (17.4)	53.0 (17.7)		
Male Gender	54.2% (N=32)	59.7% (N=92)	70.6% (N=24)		
Female Gender	45.8% (N=27)	40.3% (N=62)	29.4% (N=10)		
GCS = 15	100.0% (N=59)	92.9% (N=143)	73.5% (N=25)		
GCS = 14	0% (0)	6.5% (N=10)	14.7% (N=5)		
GCS = 13	0% (0)	0.6% (N=1)	11.8% (N=4)		
UCH-L1 (pg/mL)	43.4 (58.9)	64.0 (80.9)	132.3 (137.2)	<.0001	0.0042
s100B (pg/mL)	80.0 (80.0)	120.0 (165.0)	225.0 (210.0)	<.0001	0.0470

Table 379: Schloemann.

for concussion. Of 188 concussed subjects, 34 (18.1%) had an acute abnormality on CT (complicated mTBI). Median serum biomarker concentrations were significantly higher in complicated mTBI than in uncomplicated mTBI, and were significantly higher in uncomplicated mTBI than in no mTBI. (p<0.001) (Table 1). The association of increased biomarker concentration with concussion (AUC) was comparable for S-100B (0.69, 95%CI 0.53-0.71), and UCH-L1 (0.66, 95% CI 0.57-0.73).

Conclusion: A single biomarker serum concentration within 6 hours of head injury may be useful in determining the severity of concussion in a subset of head-injured patients.

380 A Comparison of Satisfaction with Life and the Glasgow Outcome Scale After Traumatic Brain Injury: An Analysis of the TRACK-TBI Pilot Study

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Background: In traumatic brain injury (TBI), self-perceived satisfaction with life is a recognized patient-centered outcome, yet research typically addresses functional outcome. Whether functional outcome is associated with satisfaction is not known.

Objectives: We tested the hypothesis that functional status measured using the Glasgow Outcome Scale-Extended (GOSE) is associated with the validated Satisfaction with Life Scale (SWLS), and explored factors that might confound the relationship.

Methods: The multicenter, epidemiological study Transforming Research and Clinical Knowledge in TBI enrolled patients with a clinical diagnosis of TBI and a CT within 24 hours of injury. We included patients with complete data at 6 months. Pearson's Correlation was used to test the association between GOSE and SWLS. To identify confounders, patients were grouped by scale concordance and discordance. Good recovery was defined as a GOSE >6, and satisfaction was defined as SWLS >19. Depression at six months was measured using the Brief Symptom Inventory Depression Scale. Independent T-Tests, the Mann-Whitney U-Test, or the Chi-Square Test were used to test for differences.

Results: Of 586 patients enrolled, 298 had six month data. Mean age was 42 (SD 17), 69% were male, and 9% were black. At presentation, 83% had GCS 13-15, 6% had GCS 9-12, and 12% had GCS 3-8. The SWLS was weakly correlated with the GOSE (r=0.380). Patients with poor recovery and lack of satisfaction were more likely to have mild TBI (83% vs 62%, p=0.012), history of depression (42% vs 15%, p<0.0001), depression at six months (59% vs 21%, p<0.0001), and among admitted patients, admission to a ward versus ICU (62% vs 22%, p<0.0001). Patients with good recovery and lack of satisfaction were also more likely to have a history of depression (31% vs 13%, p<0.0001), depression at six months (33% vs 6%, p<0.0001), and among admitted patients, admission to a ward (76% vs 49%, p<0.017). Demographic characteristics were similar between groups (Table 1).

Conclusion: We found minimal association between functional outcomes and satisfaction with life. Depression significantly impacts satisfaction with life. Research should consider both functional and satisfaction measures to capture patient-centered outcomes.

Table. Patient characteristics by group

	Concordant (n=205)				Discordant (n=93)			
	High GOSE High SWLS (n=129)		Low GOSE Low SWLS (n=76)		High GOSE Low SWLS (n=54)		Low GOSE High SWLS (n=39)	
Age – mean (SD)	41	(18)	43	(15)	43	(17)	43	(18)
Black – n (%)	8	(6.2)	9	(11.8)	6	(11.1)	3	(7.7)
Male – n (%)	84	(65.1)	57	(75.0)	41	(75.9)	24	(61.5)
College Education – n (%)	58	(45.0)	18	(23.7)	18	(33.3)	12	(30.8)
Employed – n (%)	89	(69.0)	41	(53.9)	30	(55.6)	23	(59.0)
Married/Cohabitating – n (%)	51	(39.5)	21	(27.6)	12	(22.2)	11	(28.2)
TBI Severity – n (%)								
Severe (GCS3-8)	10	(7.8)	11	(14.5)	3	(5.6)	12	(30.8)
Moderate (GCS9-12)	8	(6.2)	2	(2.6)	1	(1.9)	3	(7.7)
Mild (GCS13-15)	111	(86.0)	63	(82.9)	50	(92.6)	24	(61.5)

Table 380: Kreitzer.

381 Baseline Variables Do Not Predict Poor Low Back Pain Outcomes 3 Months After an ED Visit for Acute, New Onset Low Back Pain

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Background: Nearly 25% of ED patients with acute, new onset low back pain (LBP) report persistent functionally impairing LBP 3 months later.

Objectives: To determine if socio-demographic, psychosomatic, history, or physical exam features predict poor 3 month outcomes among ED patients with acute, new onset LBP.

Methods: In a study conducted in 1 ED, we randomized patients to 10days of naproxen +placebo, oxycodone/APAP, or cyclobenzaprine. Patients also received 10minutes of education and were followed by phone 3months later. The randomized study, which enrolled 323 patients, was a negative study. For this analysis, we prospectively gathered these data: age; sex; duration of symptoms; education (dichotomized into bachelors or no bachelors); depression (on validated PHQ2 instrument); psychosomatic symptoms (on validated Cassandra instrument); and presence of spasm on physical exam. The primary outcome was a score >5 on the Roland Morris Disability Questionnaire (RMDQ) a validated instrument that measures the impact of LBP on daily activities. A score >5 indicates substantial LBP related functional impairment. We built a logistic regression model in which all the variables listed above were entered and maintained in the model, in addition to investigational medication. Results are reported as OR with 95%CI.

Results: 69 of 294 patients (23%, 95%CI:19, 29%) successfully followed-up at 3 months reported RMDQ scores >5. The mean age was 39y(SD 11). 49% were women. Median duration of symptoms was 67h (IQR: 24, 108). 12% of participants had obtained a bachelor's degree. 5% were depressed. 19% reported psychosomatic symptoms. 77% had physical findings of spasm. Neither age(OR 0.98, 95%CI:0.96, 1.01), sex (OR 1.7, 95%CI:0.9,3.1), duration of symptoms(1.0, 95%CI:1.0, 1.0), education level (0.6, 95%CI:0.2, 1.7), depression (1.2, 95%CI:0.3,4.6), Cassandra score (0.8, 95%CI:0.2, 3.4), or spasm (0.7, 95%CI: 0.4,1.3) were associated with the primary outcome.

Conclusion: Age, sex, duration of LBP, education, depression, psychosomatic symptoms and spasm on exam are not associated with poor outcome after an ED visit for acute, new onset LBP. Further research is needed to determine how to predict poor LBP outcomes after an index ED visit.

382 Asymptomatic Hypertension in Urban EDs: Where Are We Now?

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Background: Asymptomatic hypertension (As-HTN) occurs at higher rates in the ED (44%) compared to the general population (27%), disproportionately affecting Blacks and the elderly. ACEP recommends referral to primary care for hypertension (HTN) management; however, adherence to this guideline is poor.

Objectives: To examine the prevalence of As-HTN; rate of BP reassessment and referral, and factors associated with it, a decade after this policy was disseminated.

Methods: A retrospective chart review for all ED encounters was performed over two weeks in each calendar quarter for the study

period 2014-2015. Adults whose initial BP was ≥ 140/90 mmHg and who were discharged were included. Two EDs participated in this investigation; both large urban academic centers in NYC. Variables included BP level, triage category, age, gender, race/ethnicity, insurance status, chief complaint, pain level, and practice patterns. Data were extracted from existing clinical database (EPIC®). Data were coded and appropriate bivariate analysis followed by multivariate regression was conducted.

Results: 1,184 patients met inclusion criteria, of which 899 patients had As-HTN. A greater proportion of the sample was male (51.3%), Black (43.2%) (p<.000), middle aged (μ 50.2 ±16), and had Medicaid (39.8%). Mean initial BP was 170/88 mmHg. A large proportion of patients with As-HTN (94.2%) had no previously diagnosed CVDs. BP reassessment rate was 49% (μ 158/88) and these patients were more likely to have no previously diagnosed CVDs (OR 1.09; CI 1.01-1.18; p = .032) and be middle aged (OR 1.25; CI 1.01-1.55; p=.040). Two percent (n=17) of patients with As-HTN were referred and 100% adhered to follow-up instructions. Having an elevated DBP (OR; CI 1.4; .07-.57; p = .034) and having no previously diagnosed CVDs (OR; CI 1.57; 1.02-1.79; p = .002) was associated with referral.

Conclusion: ED providers continue to miss opportunities to help reduce the adverse risk of having undiagnosed or under-treated HTN. Further study is needed to better understand ways to improve BP reassessment and referral.

383 Advanced Illness Management for Hospice Patients in the Emergency Department

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Background: Patients with advanced illnesses visit Emergency Departments everyday without ever having had a discussion with their health care providers regarding their goals of care (GOC) and advanced directives (AD). The Dartmouth Atlas identified Long Island Jewish Medical Center as one the highest utilizers of end of life (EOL) care.

Objectives: This quality improvement project was to identify patients in the ED with a terminal illness, conduct and document a GOC conversation, and transfer to hospice if appropriate.

Methods: An interdisciplinary team (IDT) involving a hospice agency, palliative and emergency medicine was formed. The IDT implemented a process for identifying AI patients who would benefit from being directly admitted to hospice from the ED. Our aim was to identify ED patients who met hospice criteria and to provide care that aligns with the patient and family wishes. The IDT partnered with Hospice Care Network (HCN) and the ED staff were educated on the process. Any members of the ED team were able to identify patients and start the referral process. The ED staff discussed diagnosis and prognosis with patients and families and when appropriate, discharged the patient directly to hospice. GOC and AD documentation were standardized and placed in the medical chart.

Results: From April 2013 to May 2015, 101 patients from the ED were referred directly to hospice. Since August 2014, over 95% of referrals had documented GOC discussion by ED staff. Of these patients, 39 were directly transferred to an inpatient hospice and 29 to home hospice. Of the remaining patients, 17 refused services, 9 were admitted, 5 patients expired prior to discharge, and 2 went home with expectation to transition to hospice. All patients admitted had close follow up by palliative care team. The majority of these patients died within one week.

Conclusion: Patients with AI need good GOC discussions to align with their wishes regarding EOL care The ED can be a place to incorporate discussions and processes.

384 Can a Simple Patient Flyer Drive Palliative Care Referrals from the Emergency Department?

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Background: Despite ACEP's 2013 Choosing Wisely campaign, the ED remains an underutilized gateway to palliative care services. Early integration into palliative care decreases ED visits and healthcare costs while protecting quality of life. Although ED providers increasingly recognize the value of early palliative care, they report lacking sufficient time to drive these conversations in the ED.

Objectives: To evaluate the effectiveness of a low-resource patient flyer in triggering patient-driven palliative care referrals directly from the ED.

Methods: Patients presenting to a single tertiary academic center ED who had never previously seen palliative care and who screened in for palliative care benefit by previously validated criteria were eligible. A one-page invitational palliative care flyer was designed for patients in collaboration with the palliative care service. Any ED care provider could identify appropriate patients and provide this flyer. Training sessions engaged leadership among ED clinicians, nursing, social work, and case management. If patients subsequently opted-in after receiving flyer, the clinician then placed either an inpatient or outpatient palliative care referral depending on the patient's final disposition. Electronic medical record data tracked referral orders.

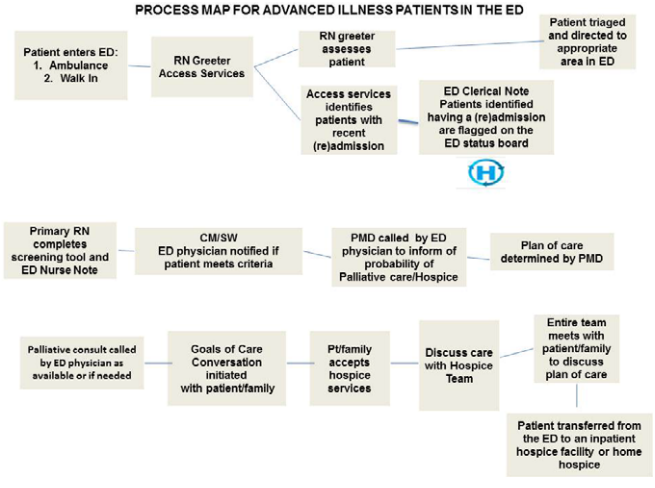

Figure 383 – Kwon

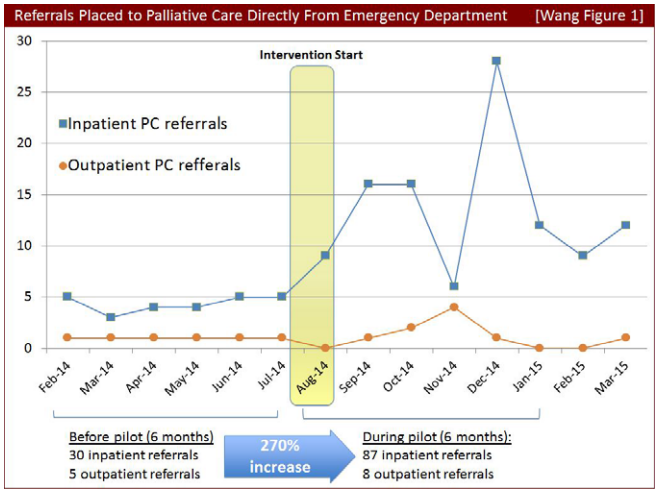

Figure 384 – Wang

Results: Inpatient palliative care referrals increased 270% during the intervention period (see Wang Figure 1). In the six months pre-intervention (03/2014-08/2014), 30 inpatient and 5 outpatient referrals were placed from the ED. In the six months following launch (09/2014-02/2015), 87 inpatient referrals (p=0.01) and 8 outpatient referrals were placed. Referrals were evenly distributed across each month, suggesting negligible ED provider fatigue over time. Inpatient referrals averaged 5/month pre-intervention and 15/month post-intervention.

Conclusion: A simple patient flyer significantly increases palliative care referrals directly from the ED without adding burden to current ED provider practices. This patient flyer is now integrated into the ACEP Palliative Care Toolkit. Further research will prioritize approaches to capture the outpatient referral population.

385 Are Geriatric Patients Placed in an Emergency Department Observation Unit on a Chest Pain Pathway More Likely than Non-Geriatric Patients to Re-Present to the Hospital Within 30 Days?

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Background: The use of an emergency department observation unit (EDOU) for low risk chest pain (CP) evaluation has become common practice to improve resource utilization, and reduce unnecessary admissions and overcrowding. Geriatric (age ≥ 65) (GERI) patients presenting to an EDOU with CP may have inherent complexities that make them less amenable to an EDOU evaluation.

Objectives: We compared EDOU patients' 30 day re-presentations, length of stay (LOS), and use of stress testing in GERI vs non-GERI patients.

Methods: We conducted a retrospective, observational cohort study at a single, academic, urban ED of all adult patients placed in an EDOU CP protocol from 6/1/14 to 5/31/15 through a query of the hospital clinical database. We excluded any return visits beyond 30 days. Our primary outcome was any unscheduled return visits within 30 days of discharge from the EDOU. Secondary outcomes included EDOU LOS (measured in hours) and stress testing. Wilcoxon non-parametric tests and chi squared analysis was used to compare GERI to non-GERI patients. Patient demographics, comorbidities, and diagnoses were also collected.

Results: There were 959 unique EDOU visits of GERI (n = 219) and non-GERI (n = 740) patients. GERI compared to non-GERI patients had: no significant difference in unscheduled 30 day return visits after discharge from the EDOU (15.5% [95% CI 11.3% - 21.0%] vs. 18.5% [95% CI 15.9% - 21.5%]; p=0.31); a significantly longer median (IQR) EDOU LOS (22.1[9.4] vs. 20.6[8.9]; p<0.01) with a greater percentage staying longer than 24 hours (42% [95% CI 35.7% - 48.6%] vs. 29.1% [95% CI 25.9% - 32.4%]; p < 0.01). GERI patients had significantly fewer stress tests (39.7% [95% CI 33.5% - 46.3%] vs. 51.4% [95% CI 47.8% - 54.9%]; p<0.01), but more of those were nuclear stress tests (78.2% [95% CI 68.3% - 85.6%] vs. 39.5% [95% CI 34.7%- 44.5%]; p<0.01). Two patients in each group had re-presentation within 30 days for serious cardiovascular diagnoses.

Conclusion: GERI EDOU CP patients did not have an increased rate of re-presentation to the hospital within 30 days compared to non-GERI patients. GERI patients had fewer EDOU stress tests, but more were nuclear stress tests. A prospective study with standardized criteria for testing and outpatient follow-up may clarify the process of evaluating GERI populations with CP in an EDOU.

386 Delirium in the Emergency Department and Its Extension into Hospitalization (DELINEATE) Study: Effect on 6-month Functional Status and Cognition

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Background: The natural course of emergency department (ED) delirium and its effect on long-term outcomes are unclear.

Objectives: To describe the extent in which ED delirium persists into hospitalization and determine how this persistence affects 6-month functional status and cognition.

Methods: This prospective cohort study enrolled all delirious and a random selection of non-delirious ED patients who were ≥ 65 years old and admitted to the hospital. The Brief Confusion Assessment Method was used to ascertain delirium in the ED and daily during hospitalization. Premorbid and 6-month function were determined using the Older American Resources and Services activities of daily living (OARS ADL) scale which ranges from 0 (completely dependent) to 28 (completely independent). Premorbid and 6-month cognition were determined using the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) which ranges from 1 to 5 (severe cognitive impairment). Multiple linear regression was performed to determine if ED delirium and its persistence were associated with 6-month function and cognition adjusted for premorbid OARS ADL or IQCODE, age, comorbidity burden, severity of illness, nursing home residence, and CNS diagnosis.

Results: 228 older ED patients were enrolled. The median (IQR) was 74 (59, 81.5) years old, 126 (55%) were female, and 30 (13%) were non-white race. Of the 105 (46%) who were delirious in the ED, 81 (77%) remained delirious during hospitalization and the median (IQR) delirium duration was 4 (2, 6) days. A total of 159 patients survived and had a 6-month OARS ADL. For every ED and subsequent hospital delirium day, the 6-month OARS ADL score decreased by 0.61 points (95%CI: -1.00 to -0.23) after adjusting for premorbid OARS ADL and other confounders, indicating a higher risk of dependency. In 110 older patients who survived and had a 6-month IQCODE, for every ED and subsequent hospital delirium day, the 6-month IQCODE increased 0.06 points (95% CI: 0.01 to 0.11) adjusted for premorbid IQCODE and other confounders, indicating a higher risk of poorer cognition.

Conclusion: Delirium in the ED is not a transient event and frequently persists into hospitalization. For every additional day an ED patient is delirious, there is an incremental worsening of 6-month functional status and cognition.

387 Disparities in the Treatment of Pain in Cognitively Impaired Versus Cognitively Intact Older Adults Presenting to the ED with Acute Hip Fracture

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Background: The inadequate treatment of pain remains a major public health problem. Older adults and cognitively impaired older adults are especially vulnerable to undertreatment of their acute pain while in the ED.

Objectives: To test the hypothesis that cognitively impaired older adults presenting to the ED with acute hip fracture are less likely to receive any analgesic, less likely to receive an opioid analgesic, and less likely to receive a parenteral analgesic compared with cognitively intact older adults.

Methods: This is a prospective, observational cohort of ED patients aged 65 years and older with an acute hip fracture. Cognitive status was tested using TICS (Telephone Interview for Cognitive Status). Descriptive statistics were calculated for all variables and distributions examined for outliers and errors. The primary outcome was pain treatment. Chi-square tests were used to compare the proportion of patients who received any analgesics vs. no analgesics, opioid analgesics vs. non-opioid analgesics, and parenteral vs. nonparenteral administration in those with and without cognitive impairment. Two-sided adjusted Wald confidence intervals were used to calculate the difference between two independent proportions.

Results: 144 patients were enrolled. In the cognitively impaired group (n=96 (67%)), the mean age was 85 years and 77% were female.

In the cognitively intact group (n=48 (33%)), the mean age was 82 years and 58% were female. 83% of cognitively intact patients received any pain medication vs. 73% of cognitively intact patients for a difference of 10.7% (95% CI -4.0% to 23.8%). 83% of cognitively intact patients received an opioid vs. 70% of cognitively impaired patients for a difference of 13.9% (95% CI -1.1% to 27%). 95% of cognitively intact patients received parenteral analgesics vs. 89% of cognitively impaired patients for a difference of 6.4% (95% CI -5.5% to 16.3%).

Conclusion: More than 10% of cognitively impaired older adults with acute hip fracture were less likely to receive any analgesic and less likely to receive an opioid analgesic compared to cognitively intact older adults presenting to the ED with acute hip fracture.

388 Modifiable Risk Factors for Malnutrition Among Older Adults Receiving Care in the Emergency Department

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Background: Malnutrition affects an estimated 3 million older adults in the US and is associated with functional decline, decreased quality of life, and mortality. ED visits provide an important opportunity to identify malnourished older adults, but how best to intervene in these patients is not known.

Objectives: The purpose of this study was to estimate the population attributable risk proportion for known risk factors for malnutrition among older adults presenting to US EDs.

Methods: Screening and enrollment of cognitively intact patients aged 65 years and older who were not critically ill were completed using random time block sampling at 2 EDs in distinct regions of the US. Malnutrition was defined using the Mini Nutritional Assessment Short-Form. Risk factors were assessed using validated measures and included access to food, oral health, and depression symptoms. Population attributable risk proportions were calculated for each risk factor.

Results: Among the 138 older ED patients who were eligible, 133 (96%) consented to participate. Of these patients, 16% (95%CI 10 to 22%) were malnourished. Malnutrition was more common among patients admitted to the hospital than patients who were discharged (22% vs. 8%, p<0.05). Malnutrition was present among 25% of those with limited access to food, 27% of those with poor oral health, and 29% of those with depression symptoms. The population attributable risk proportions for these factors were 10% (95%CI -4 to 33%), 33% (95%CI 6 to 59%), and 30% (95%CI 6 to 56%), respectively (Richmond Table). Among the 58 patients who stated another reason for not eating well, 40% attributed their eating problems to loss of appetite and 19% to a gastrointestinal problem.

Richmond Table. Malnutrition prevalence and population attributable risk proportion, by risk factor.

Risk Factor	Total n	Malnourished [a] n(%)	Population attributable risk proportion %(95%CI)[b]
Food Insecurity [c]			9.9 (-4 to 33)
Severe or Moderate	16	4 (25)	
Mild or None	113	15 (13)	
Oral Health [d]			32.8[e] (6 to 59)
Poor	33	9 (27)	
Moderate	37	6 (16)	
Good	59	3 (5)	
Depression [f]			30.4 (6 to 56)
Yes	31	9 (29)	
No	96	10 (10)	

a. Defined as a score 0-7 on the Mini Nutritional Assessment Short Form
b. Because malnutrition may be due to more than one of these risk factors, the sum of the population attributable risk proportions may exceed 100%
c. Defined using the Household Food Insecurity Access (HFIAS); N=129
d. Defined using the Geriatric Oral Health Assessment Index (GOHAI), where scores of ≤50 is poor, 51-56 is moderate, and ≥57 is good oral health; N=129
e. Calculated by combining "moderate" and "good" categories
f. Defined as ≥4 on the 10-item Center for Epidemiological Studies Depression Scale (CES-D); N=127

Table 388: Richmond.

Conclusion: Poor oral health and depression are important contributors to the overall burden of malnutrition among older ED patients; addressing these problems in malnourished older adults may improve health outcomes.

389 Assessment of Lethal Means Access Among Suicidal Emergency Department Patients

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Background: Firearm access increases risk of death among those with suicidal ideation or attempts (SI/SA), and national guidelines recommend ED-based counseling for suicidal patients to reduce home access to firearms and other lethal means of suicide. Prior surveys suggest such counseling does not occur routinely.

Objectives: Among ED patients with SI/SA, to describe home firearm access and to examine ED provider assessment of access to lethal means of suicide.

Methods: This secondary analysis used cross-sectional data from the Emergency Department Safety Assessment and Follow-up Evaluation, a 3-phase, 8-center study of adult ED patients with SI/SA (2010-2013). Research staff interviewed all participants using a structured questionnaire (including questions about home firearms) and reviewed the ED chart using a structured abstraction form (including identification of documented assessment of home access to lethal means).

Results: Among 1358 enrolled patients with SI/SA, the median age was 36 years (IQR: 25-47), 44% were male, and most were white (75%) and non-Hispanic (88%). Overall, 11% (95%CI 10-13) reported ≥1 firearm at home; rates varied across sites (range: 6%-26%) but not over time. Men and women were equally likely to have easy home firearm access, though men were more likely to be the owner. On chart review, 50% (95%CI 47-52%) of patients had medical record documentation of lethal means access assessment. Frequency of documented assessment increased over study phases but was not associated with state firearm ownership rates. Among patients discharged home from the ED (25%, 95%CI 23-27%), only 45% (95%CI 40-51) had documentation of lethal means assessment.

Conclusion: Reducing home access to firearms and other lethal methods of suicide - including by assessment and counseling of at-risk ED patients - has the potential to save lives. Yet in this cohort of patients with SI/SA, many did not appear to have been asked about

home access to lethal means, including some patients who did have ≥1 firearm at home who were discharged home.

390 Emergency Department Ultrasound Diagnosis of Small Bowel Obstruction

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Background: Patients with bowel obstruction often present with undifferentiated abdominal pain. The use of ultrasound (US) as a primary diagnostic modality for the identification of small bowel obstruction has been evaluated in a few small studies with high prevalence of obstruction, and has been shown to be more accurate than xray, which previous studies have shown to be diagnostic only 50-60% of the time.

Objectives: To validate these previous studies in our setting, and to determine the test characteristics of emergency physician (EP) performed US.

Methods: The study is a prospective, observational study. Resident, fellow, and attending physicians with an interest in bowel US took a 30-minute training consisting of demonstration of the protocol and overview of images of normal and obstructed bowel. We enrolled adult patients presenting to the Emergency Department with 1. symptoms suggestive of bowel obstruction, including abdominal pain, vomiting, and/or constipation, 2. having the clinician's pretest probability of greater than very low probability of bowel obstruction, and 3. plan to further imaging by abdominal computed tomography or abdominal radiographs to evaluate for bowel obstruction. The US examination consists of scanning through each of the four quadrants of the abdomen, identifying the most dilated loop of small bowel in each quadrant and measuring its diameter, and characterizing the degree of peristalsis. Bowel obstruction was defined as dilated loops of bowel >2.5 cm in diameter with to and fro peristalsis. The primary outcome was the diagnostic performance of EP-performed US of the abdomen, compared to CT scan results.

Results: 103 patients were enrolled. 27 were ultimately diagnosed with small bowel obstruction (26%). EP-performed US demonstrated a sensitivity and specificity of 85% and 84% respectively, and a positive likelihood ratio and negative likelihood ratio of 5.4 and 0.18 respectively.

Conclusion: Emergency physician performed US for the diagnosis of small bowel obstruction has a sensitivity of 85%, which compares favorably to plain radiographs. US is a more sensitive screening tool than plain radiographs for bowel obstruction, and both a positive and a negative test result have a moderate effect on the pretest probability of bowel obstruction.

391 County Poverty and Unintentional Overdose Mortality: United States, 1999-2012

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Background: Unintentional drug poisoning is a growing cause of morbidity and mortality in the US. In 2010, unintentional drug overdoses surpassed motor vehicle accidents for the leading cause of death for people over 20 years of age, and in 2013 became the leading cause of all unintentional injury death in the U.S.

Objectives: No study has examined trends over time and the relationship between changes in area poverty and overdose mortality. Our objective was to further characterize how the trends in overdose mortality are affected by changes in area poverty.

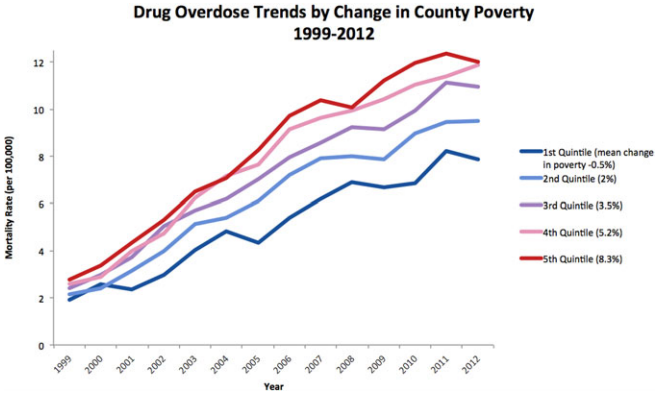

Figure 391 – Karb

Methods: Annual compressed mortality and population data for 1999-2012 for the entire US population from the National Center for Health Statistics were linked with census county poverty measures. We calculated age-adjusted mortality rates and time trends for county poverty categories, and used multivariate negative binomial regression to determine the relative risk of living in high poverty concentration areas.

Results: Overall age-adjusted mortality rates for unintentional overdoses in the US increased from 3.98 per 100,000 to 10.41, a rise of 160 percent. This increase was driven primarily by increases in multi-drug overdoses, the majority of which involve narcotics. Among high poverty areas (greater than 25 percent poverty rate), the mortality rate increased from 5.22 to 12.33 per 100,000. The rise in mortality was found to be greatest within counties that had greater increases in poverty. For every 1 percent rise in county poverty, there was a significant increase in mortality rate of 0.34 per 100,000.

Conclusion: Prior studies have demonstrated the deleterious effect of neighborhood poverty on health, including drug overdoses. Our study contributes to this body of knowledge by demonstrating a *change-on-change* effect, strengthening our ability to make causal claims about the relationship between poverty and unintentional overdoses. The emergency department plays a key role in the treatment of drug poisonings, and is also poised to play a unique role in intervening to prevent drug overdoses or mitigate their negative effects. Understanding the community-level factors that shape these trends can aid in targeting interventions.

392 Leftover Opioid Analgesics and Prescription Drug Disposal Following Outpatient Dental Surgery: Results of a Pilot Randomized Controlled Trial

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Background: Opioid analgesics are routinely used to treat acute pain among ED patients, but there are risks to prescribing more opioids

than patients use. Individuals who abuse prescription opioids often use leftover pills that were prescribed for friends or family members.

Objectives: We sought to measure the rate of unused opioid analgesics after a painful procedure (tooth extraction) and to gather pilot data on an intervention to promote safe disposal of prescription drugs.

Methods: A pilot randomized controlled trial was conducted among adult patients undergoing tooth extraction at a university-affiliated oral surgery practice during March-August 2015. Patients in the intervention arm received information on a retail pharmacy program that offered store credit to patients who disposed of prescription opioids. We collected data on pain level and analgesic use by means of daily automated text message surveys that patients completed on mobile devices. The primary outcome was the number of opioid pills used by 3 weeks after surgery. Secondary outcomes included (1) the median number of days that patients used opioid analgesics and (2) the proportion of patients who intended to keep their leftover pills.

Results: We enrolled 79 patients during a predefined six month period. Patients completed 688 out of 711 surveys (97%) distributed by the mobile health tool. Among 72 individuals who received and filled an opioid prescription, the average patient received 27 pills (range 10-30) and used 14 of them (53%) by 3 weeks after surgery. A total of 936 opioid pills were left unused. Patients used opioid analgesics for a median of 3 postoperative days (IQR 1-5 days). Compared to the control arm, the intervention was associated with a 19% absolute reduction in the proportion of patients who intended to keep their leftover opioids (52% vs 71%, p=0.18).

Conclusion: Nearly half of opioids analgesics prescribed after tooth extraction are not used. Future research should examine the rate of leftover pills among ED patients receiving opioid prescriptions for acute painful conditions. Our pilot results should be validated in a larger trial among ED patients. By partnering with local pharmacies to promote drug disposal, EDs may help reduce prescription drug diversion and abuse in their communities.

393 Long-Term Healthcare Utilization and Mortality Among Victims of Violence

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Background: Many victims of violence are socially marginalized with poor access to healthcare. The risk of reinjury and death among young victims of violence (under 30) is well documented. Hospital based violence intervention programs are effective in reducing these risks, and ED visits are key opportunities for engaging patients. Although 40% victims of violence are over 30, little is known about the risk of reinjury or death in this older population.

Objectives: We tested the hypothesis that victims of violence over 30 have a higher 10-year mortality rate and pose a greater burden to the healthcare system than younger victims.

Methods: This is a retrospective cohort study nested within a randomized controlled trial. Victims of violence presenting to a Level I trauma center were enrolled from 2001-4. Rates of ED visits, hospital admissions and mortality were measured over the next 10 years. We compared younger (18-29) and older (over 30) patients' rates of healthcare utilization and death using bivariate analysis and logistic regression. Excess age-adjusted mortality was calculated using the National Vital Statistics Report.

Results: We enrolled 541 subjects. Mean age was 37, 70% were over 30, and 75% were male. Social marginalization including homelessness (41%) and unemployment (63%), mental illness (64%), and substance abuse (73%) were prevalent in the cohort. Subjects over 30 averaged significantly more ED visits (7.4 vs. 2.8, $p < 0.01$) and hospital admissions (2.0 vs. 1.0, $p < 0.01$) than younger subjects in the 10 years following their index injuries. The 10-year mortality rate was significantly higher for subjects over 30 (18% vs. 9%, $p < 0.01$). This difference remained after adjusting for increased mortality due to age. Social marginalization, mental illness and substance abuse all predicted increased healthcare utilization and mortality.

Conclusion: In this cohort, victims of violence over 30 had more ED visits and hospital admissions and were at higher risk of death, even after adjusting for age. As a very vulnerable population with a high rate of healthcare utilization, they may benefit from targeted risk reduction interventions. ED visits following violent injuries are key opportunities to engage these patients.

394 ED Revisits Within 3 Days of an ED Discharge Among Elderly Patients

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Background: There has been an increased effort in recent years to decrease hospital readmissions as both a quality initiative and healthcare cost and payment reform measure. Although much of this effort is focused on inpatient readmissions, the ED plays an instrumental role in decreasing preventable inpatient admissions.

Objectives: The objective of this study was to investigate ED utilization within 3 days of an ED discharge among geriatric patients.

Methods: This was a multi-center retrospective longitudinal cohort study of 325 licensed non-military acute care hospitals in California in 2013 using non-public data. Visits without a valid patient identifier and patients under the age of 65 years were excluded. The primary outcome was 3-day ED utilization following an ED discharge. Discharge dispositions of expired, discontinued care, and admitted/transferred were excluded as index ED visits. Multivariate logistic regression analysis was used to compare patients who did and did not return to the ED within 3 days on demographic characteristics, payer, comorbidity, injury presentation, and substance abuse and mental health diagnoses. Adjusted odds ratios (OR) and 95% confidence intervals (CI) are reported.

Results: A total 12,717,896 ED visits were included in the study period, of which 829,172 patients met inclusion and exclusion criteria resulting in 1,261,523 index ED visits. A total of 73,600 (9.0%) returned to the ED within 3 days, resulting in in at least one admission for 36.6% of these patients. 18.4% of return ED visits were to a different facility and 25.7% were for the same primary diagnosis. Factors with the highest independent association with 3-day return ED visits in logistic regression analysis were male gender (OR=1.32, 95% CI=1.30-1.34), payer (Medi-Cal, OR=1.33, 95% CI=1.26-1.40 and Self-pay/Indigent, OR=1.33, 95% CI=1.26-1.40; ref=Private), and diagnosis of substance abuse (OR=1.47, 95% CI=1.43-1.51).

Conclusion: In this study of 325 non-military licensed EDs in California, 9% of all geriatric patients who were discharged from an ED returned to the ED within 3 days, and approximately one-third of these return ED visits resulted in admission. Novel approaches, such as acute home health care, may relieve some of these ED revisits and admissions.

395 Ultrasound for the Evaluation of Soft Tissue Foreign Bodies Before and After the Addition of Fluid to the Surrounding Interstitial Space in a Cadaveric Model

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Background: Point of care ultrasound is capable of visualizing foreign bodies (FB) of varying densities and may be used to facilitate FB localization and removal. Fluid is an excellent medium for the transmission of sonographic waves. In the soft tissue, interstitial fluid

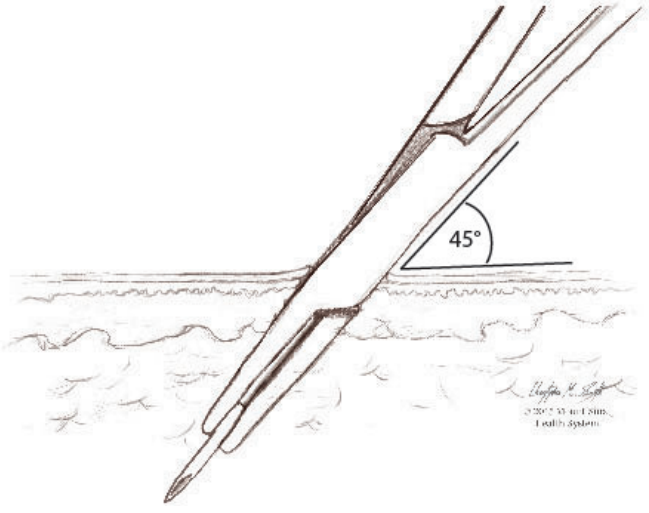

Figure 395 – Saul

outlines and creates hypoechoic halos around structures. Additionally, interstitial fluid causes the tissue to swell, moving the area of interest further out of the dead zone and closer to the focal zone of the transducer.

Objectives: To determine if adding fluid to the interstitial space in the area of a suspected FB increases sonographic accuracy. Secondly, since organic material does not have as many artifactual clues as metal, we suspected that any differences would be more pronounced with organic FBs.

Methods: The procedure was performed on the lower extremities of one embalmed human cadaver. FBs were created from toothpicks (wood) and 21G needles (metal). Each FB was 1 cm long, 1-3 mm wide and was inserted 1 cm at a 45° angle. There were 24 wood, 24 metal and 24 null sites. After two emergency physicians (EP) scanned the 72 FB sites, the study investigators inserted a 25-gauge needle 1 cm into each incision and injected 3 cc of normal saline (NS). The EP sonographers then reevaluated the 72 sites. Data was analyzed using binomial tests and student's t-test.

Results: Pre-injection, 116/144 (81%, p= <0.001) of the interpretations were correct in their assessment of whether or not an FB was present, with a sensitivity of 81% (95% CI 72% - 88%) and a specificity of 79% (95% CI 65% - 90%). Post-injection, 119/144 (83%, p= <0.001) of these interpretations were correct in their assessment of whether or not an FB was present, with a sensitivity of 85% (95% CI 77% - 92%) and a specificity of 77% (95% CI 63% - 88%). The difference between these two methods was not statistically significant (p=0.08, CI -0.04 to 0.01).

Conclusion: Ultrasound was reasonably accurate, sensitive and specific in identifying FB in cadaveric human tissue. Accuracy and sensitivity were not significantly different after the injection of 3cc of NS into the possible FB sites. The density of embalmed tissue made local injection of fluid difficult. We plan a future study of this technique in a live anesthetized tissue model.

396 Measurement of Carotid Artery Flow Time Via Point-of-Care Ultrasound in Hemodialysis Patients

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Background: Accurate and rapid assessment of intravascular volume status remains a significant challenge in both emergency and critical care medicine. Esophageal Doppler Monitoring (EDM) of the corrected flow time in the proximal descending aorta is a validated technique for assessing intravascular volume. However, while it is minimally invasive, EDM does require placement of a small probe in the mid esophagus. Several prior studies have reported that measurement of carotid artery corrected flow time (FTc) using bedside ultrasonography correlates to presumed changes in intravascular volume while being significantly less invasive.

Objectives: To determine if significant changes in carotid artery FTc could be measured in end stage renal disease patients receiving hemodialysis with the presumed corresponding change in intravascular volume.

Methods: We enrolled a prospective cohort of ESRD patients undergoing non-emergent hemodialysis. Measurements of pre-dialysis and post-dialysis flow time were made over the right or left common carotid artery. Flow time, corrected for heart rate, was calculated and other clinical variables, including volume of fluid removed, were recorded. Pre- and post-dialysis corrected carotid flow times were analyzed using a paired t-test.

Results: A total of 47 hemodialysis patients were enrolled and data from 31 patients was available for final analysis after exclusion of patients with inadequate images or incomplete clinical data. There was no statistically significant difference in mean FTc between pre- and post-dialysis assessments (P = 0.06). Mean pre-dialysis FTc was 319 ms (95% CI, 304 - 333) and mean post-dialysis FTc was 309 ms (95% CI, 296 - 321). Average volume of fluid removed was 2059 ml.

Conclusion: We were unable to detect a statistically significant difference in FTC after dialysis in our small cohort of hemodialysis patients.

397 Ultrasound-Guided Radial Artery Compression to Assess Blood Pressure

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Background: We propose using compression sonography to observe the deformation and collapse of the radial artery as a surrogate for automated cuff pressures. We hypothesize that the pressure required to achieve coaptation and complete collapse of the artery will correlate to the diastolic and systolic blood pressure, respectively.

Objectives: Our primary aim was to assess the feasibility of ultrasound-guided radial artery compression (URAC) for blood pressure measurement. Our secondary aim was to compare patient comfort levels during automated cuff and URAC measurements.

Methods: This was a prospective cohort study of a convenience sample of 25 adult patients at a single urban ED. URAC pressure was measured followed by cuff monometry on the same arm. A 100mL NS bag was connected to the Stryker pressure monitor and placed on the volar wrist. Pressure was applied to the bag with a linear transducer and the radial artery was observed for coaptation of the anterior and posterior walls (diastolic pressure) and complete collapse (systolic pressure). Pressures were subsequently recorded. Patient level of comfort was also documented during the URAC method, with patients reporting either 'more', 'same' or 'less' comfort in comparison to automated cuffs. Data was analyzed using intraclass correlation and paired t-tests.

Results: The mean cuff systolic BP was 138.6 ± 22.1 mmHg compared to 126.9 ± 19.8 mmHg for the URAC systolic BP(p=0.02). For diastolic blood pressure, there was no significant difference between the cuff BP and the URAC BP (83.7 ± 13.0 cuff vs. 86.5 ± 19.8 URAC, p=0.46). The intraclass correlation (ICC) for systolic BP was 0.48 (p=0.04) and 0.57 (p=0.02) for diastolic BP (see Butki Table 1). 80% (20/25) of subjects found the URAC method more comfortable than the cuff measurement, and the remainder found it the same (5/20).

Conclusion: This preliminary study concluded there was a statistically significant moderate correlation between automated cuff

and URAC measurements, though stronger for the diastolic measurement. Additionally, most patients found the URAC method more comfortable than traditional cuff measurements. Compression ultrasonography shows promise as a surrogate for BP measurement, though future studies are needed.

398 DNA Melt Signatures: Singleplex High Complexity Melt for Unknown Bacterial Species Identification

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Background: Etiologic diagnosis of acute febrile illnesses should be broad and unbiased, allowing for efficient antibiotic stewardship and reduce patient morbidity and mortality. High Resolution Melt (HRM), where amplicon's sequence variants are interrogated by a process of heat denaturing in the presence of an intercalating dye, takes place as a single-step, closed tube process performed directly on generic real-time PCR platforms. Due to these advantages, our goal is to develop strategies for using HRM to accomplish reliable sequence fingerprinting for eubacterial species identification.

Objectives: To develop a broad-based DNA melt assay using a single primer set to identify clinically relevant bacterial pathogens.

Methods: We performed real-time PCR followed by HRM analysis using a single primer set targeting a phylogenetic locus on 98 bacterial species. We validated our library with clinical samples which include 87 positive blood culture bottles and 60 cerebrospinal fluid samples. To classify the unknown melt curves, we utilized an improved support vector learning algorithm.

Results: We developed a full library of melt curves for each of the 98 organisms with increased diversity of melt curves. Our results were concordant with both culture and sequencing findings for 86/87 (98.9%) blood samples for species identification. Omitting samples that are determined as polybacterial in conventional culture results, absent of reference, and discordant culture and 16S sequencing results, we correctly identified 77 samples with 1 discrepancy, for a 98.7% sensitivity, and 100% specificity. For the CSF samples, our assay gives a sensitivity and specificity of 100% and 96%, respectively.

Conclusion: HRM coupled with machine learning classification is a simple and practical assay that can provide highly informative data within minutes and could be easily adopted into clinical practice. Our study is also the first assay to successfully differentiate 98 bacterial species using a singleplex approach.

399 Effect of Clinical Overlap on Attending Comfort Evaluating Residents: A Multicenter Study

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Background: Obtaining resident evaluations from attending physicians is notoriously difficult. Lack of attending comfort evaluating residents may contribute if contact between attendings and residents is sporadic or rare.

Objectives: 1. Determine the extent to which attendings and residents overlap clinically. 2. Determine if extent of overlap affects attendings' comfort evaluating residents.

Methods: The study was conducted at 2 sites with 2 large residency programs. All attending and resident schedules were mapped to each other to determine overlap hours, noting "swing" shifts (resident presents to >1 attending) or "senior" shifts (resident presents to senior resident). After each of 2 scheduling blocks, a convenience sample of attendings rated their comfort level evaluating each resident with whom they had worked on a 5-point Likert scale. Kendall's Tau was employed to determine overall correlation between comfort and overlap, non-swing overlap, and non-senior overlap. Spearman's Rank Correlation was employed to determine the same within each post-graduate year (PGY), and correlation between PGY and comfort.

Results: Schedule mapping was performed for 2761 episodes of overlap (mean 5.4 h, std dev 2.9 h) for 1706 attending-resident pairings. The mean (std dev), median and range of hours of overlap per block were 8.7 (6.6), 8.0 and 1-52 overall, 4.0 (5.7), 1.0 and 0-36 without swing shifts, and 8.1 (6.4), 7 and 0-47 without senior shifts. 80 surveys were completed (98% response rate) representing 1128 pairings: 52.4% "very comfortable", 22.0% "somewhat comfortable", 8.1% "neutral", 9.9% "somewhat uncomfortable" and 7.7% "very uncomfortable". Overlap, non-senior overlap and non-swing overlap did not predict comfort (z=0.42, 1.78, 0.79, tau = 0.01, 0.04, 0.02, P= 0.67, 0.07, 0.43). PGY level was available for 1 site (485 pairings, all PGY3 and 4 shifts were non-senior). Table 1 gives the only Spearman Rank Correlation results with $P < 0.05$.

Conclusion: As expected, attending-resident overlap is often minimal and compromised by not working 1-on-1. Attendings reported surprising comfort evaluating residents overall, correlating strongly with resident PGY, but not hours of overlap. This raises the possibility that attending feedback for a block might really reflect aggregate experience with that resident.

Spearman's Rank Correlation Results with $P < 0.05$

Comparison	Rho	P Value
PGY, Comfort	0.31	<0.01
Total Hours (PGY3), Comfort	0.23	<0.01
Total Hours (PGY4), Comfort	0.19	0.02

Table 399: Rabin.

400 A Second Chance for Droperidol in the Emergency Department?

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Background: Use of droperidol in the emergency department (ED) has declined dramatically since the 2001 black box warning, but research interest has accelerated.

Objectives: We conducted a structured review on the safety and efficacy of droperidol for treatment of acute agitation in the ED.

Methods: The National Library of Medicine (PubMed) and Google Scholar were queried to identify peer-reviewed studies that reported clinical outcomes in the ED or adverse events associated with use of droperidol in any setting. Studies of the clinical efficacy of droperidol were limited to prospective, randomized controlled trials that compared droperidol to other agents or to placebo. Case series, case reports, experimental studies, and structured reviews that examined the safety of droperidol were included, including those on anti-emetic dose droperidol. Special attention is paid to published analyses of cases on which the 2001 black box warning were based. Data on the incidence of QT interval prolongation and serious adverse events, including torsades de pointes and death are presented.

Results: 12 studies examining efficacy and 13 studies examining safety met inclusion criteria. Droperidol was found to have equivalent or superior efficacy to other first-generation antipsychotics, atypical antipsychotics, or benzodiazepines for the management of acute agitation in the ED in all relevant studies. Evidence regarding QT interval prolongation is mixed; data associating droperidol with arrhythmia or other major adverse events are of low quality, particularly for doses used in the ED.

Conclusion: A preponderance of evidence suggests Droperidol is a safe and effective treatment for acute agitation. In light of the frequency with which droperidol was administered prior to 2001, the limited number of documented adverse cardiac events suggests that these are rare. It remains underutilized since the black box warning, while evidence supporting its use continues to accumulate.

401 Clinical Predictors of Death from Severe Sepsis Within 24 hours of ED Admission

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Background: Patients presenting to the Emergency Department (ED) with severe sepsis continue to have a high risk of in-hospital mortality. Of particular concern are those at risk of early death. However, little is known about the clinical features of this high-risk patient population.

Objectives: Identify predictors of early death in patients presenting to the ED with severe sepsis.

Methods: Secondary analysis of two prospective cohorts of adult ED patients with severe sepsis from one single-center and one multi-center study. Patients were enrolled from the period of 2007 to 2014. A multivariable logistic regression model was created to inform predictors of early death. Student's T test or Wilcoxon's rank sum were used for comparison of means where appropriate.

Results: Out of 410 severe sepsis admissions, 20 patients experienced the primary outcome of early death (death within 24 hours of ED arrival). Multivariable logistic regression identified the following predictors of early death: initial serum lactate level (OR 1.27, 95% CI 1.1-1.4), modified Sequential Organ Failure Assessment (mSOFA) score (OR 1.2, 95% CI 1.0 - 1.4), and active cancer (OR 3.1, 95% CI 1.1 - 9.2). Age and initial systolic blood pressure less than 90 mm Hg were not significant predictors of early death. Wilcoxon's rank sum identified the respiratory component of the mSOFA (z=-3.2, p =0.0014) and the cardiovascular component of the mSOFA (z=-2.7, p=0.018) to be the most predictive components of mSOFA. Mean initial lactate (mg/dL) was significantly different for those with early death (8.2, 95% CI 6.0 - 10.4, p < .001) versus early survivors (3.9, 95% CI 3.6 - 4.1, p <.001). Medians and interquartile ranges (IQR) for mSOFA between groups were 10 (IQR 6-11) for those with early death vs 6 (IQR 4-8) for early survivors (p<.001).

Conclusion: Differences in initial serum lactate, mSOFA score, and active cancer may predict early death from severe sepsis for adult patients presenting to the ED.

402 Use of Heart Rate Variability to Assess Illness Severity in Emergency Department Patients with Sepsis

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Background: Early identification and risk stratification of patients presenting to the ED with sepsis can reduce morbidity and mortality. Prior work has shown that Heart Rate Variability (HRV) analysis of brief ECG recordings might help rapidly and non-invasively identify patients at increased risk of short-term deterioration.

Objectives: To examine the ability of HRV analysis to identify patients at increased risk of early deterioration.

Methods: Prospective cohort study of a convenience sample of ED patients satisfying 1992 SCCM/ACCP criteria for sepsis. Potential patients were identified through clinician referral and an electronic sepsis order set, then screened for enrollment by trained research assistants 24 hours/day, 7 days/week. In addition to recording baseline demographic, clinical and laboratory variables, enrolled patients had bedside ECG Holter monitoring performed for approximately 15 minutes. ECG recordings were analyzed off line to obtain the ratio of low-frequency to high-frequency power (LF/HF ratio). Patients were followed for 72 hours to identify those meeting one or more of the study endpoints, defined as requiring intubation, non-invasive ventilation, vasopressor/inotrope support, critical care unit admission, or death within 72 hours of ED presentation. Multivariable logistic regression was used to assess the association between altered HRV and subsequent deterioration after adjusting for clinically relevant variables.

Results: Of 278 enrolled patients presenting to the ED with sepsis who were subsequently admitted to the hospital, 36 (13%) reached one or more study endpoints within 72 hours of presentation. Patients with a LF/HF ratio < 1 had an odds ratio (OR) of 4.3 (95% CI [1.9, 6.6]) for achieving a study endpoint. After adjusting for age, sex, history of CHF, and mean heart rate, patients with a LF/HF ratio < 1 had an adjusted OR of 3.0 (95% CI [1.4, 6.5]) for achieving a study endpoint.

Conclusion: Rapid, non-invasive HRV analysis can help identify ED patients presenting with sepsis who are at increased risk of early deterioration.

403 Impact of an ED-ICU on Severe Sepsis and Septic Shock

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Background: Patients presenting to the emergency department with severe sepsis and septic shock make up a large proportion of hospital admissions and drive hospital mortality. Interventions exist which reliably decrease mortality and improve outcomes. The emergency department intensive care unit (ED-ICU) model has potential to further affect this important disease state.

Objectives: Determine the effects our department's ED-ICU model, the Emergency Critical Care Center (EC3) which opened in February 2015, on the management and outcomes of patients presenting for severe sepsis and septic shock. Metrics of interest included: disposition and length of stay, complications, in-hospital mortality rates, and standards of care benchmarks (eg. time to antibiotics).

Methods: This was a retrospective before-and-after EC3 opening study. Admissions for severe sepsis and septic shock between February 2014 and November 2015 were captured via an automated algorithm and a four month sample from each period was analyzed for the above metrics of interest. Sequential Organ Failure Assessment (SOFA) scores were calculated at 6 hours from triage. Patient status, determined by the physician at the time of acceptance to the EC3 as either "critical" (needs ICU) or "unknown disposition" (potential for downgrade to floor bed), was also recorded.

Results: Combined severe-sepsis and septic-shock admissions totaled 1,344 in 2014 and 2,020 in 2015; 549 of these were treated in the EC3. They were well-matched for age, gender, presenting vital signs, and initial lactate. SOFA scores were overall higher in 2015 and in EC3 patients (*Figure 1a*). In-hospital mortality for ICU patients was equivalent (*Figure 1b*). Length of stay (LOS) was higher for the initial ED encounter but shorter for ICU and equivalent for total hospital stay (*Figure 2a-c*). Meanwhile, 28.4% of patients normally admitted to an ICU went directly to a floor bed from EC3 (*Figure 3*).

Figure 1

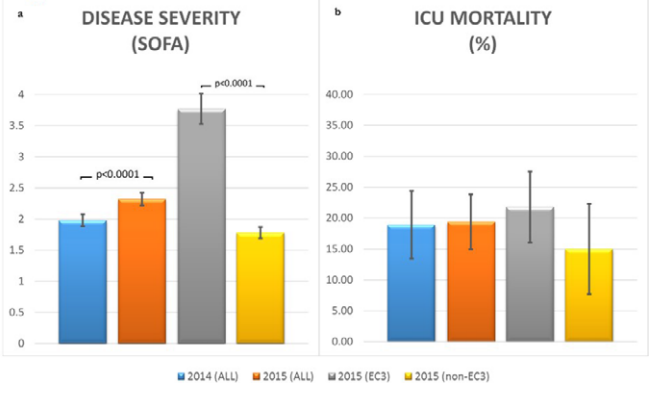

Figure 403 – Glazer

Figure 2

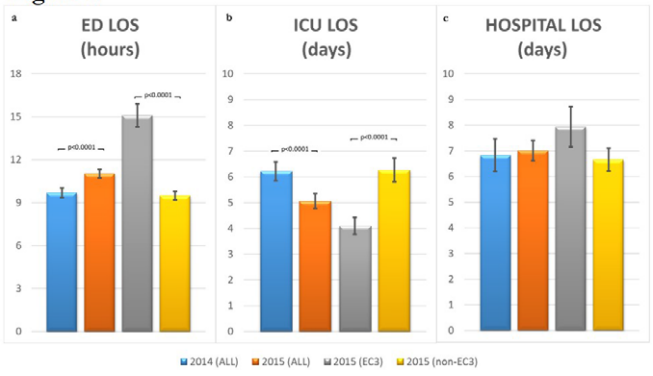

Figure 403 – Glazer

Figure 3

EC3 Status Progression (Severe-Septic)	Count	%
Critical to Critical	167	30.4%
Critical to Floor Status	156	28.4%
Critical to Discharge	0	0.0%
Critical to Expired	3	0.5%
Intensive Resource Patient to Critical	48	8.7%
Intensive Resource Patient to Floor Status	175	31.9%
Intensive Resource Patient to Discharge	0	0.0%
Intensive Resource Patient to Expired	0	0.0%

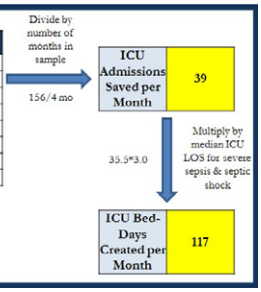

Figure 403 – Glazer

Conclusion: The EC3 model, when applied to patients with severe sepsis and septic shock, saves at least 39 ICU admissions and 117 ICU bed-days per month. Septic EC3 patients have significantly higher disease severity scores and ED LOS when compared to historical controls and contemporaneous patients treated exclusively in the ED. Despite this, they have equal mortality rates, shorter ICU LOS, and equivalent hospital LOS.

404 The Effect of an Emergency Department-Based Critical Care Unit on the Utilization of Non-Invasive Positive Pressure Ventilation and Patient Disposition

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Background: In selected patients with respiratory failure, noninvasive positive pressure ventilation (NIPPV) is an effective adjunct to usual medical therapy. In appropriate candidates, NIPPV reduces the need for endotracheal intubation, hospital length of stay, and risk of death.

Objectives: Evaluate the effect of our emergency department intensive care unit (ED-ICU) model on the utilization of NIPPV, patient outcomes, and resource utilization metrics.

Methods: This was a retrospective review of patients that required NIPPV utilizing data from the electronic medical record before and after implementation of an ED-ICU at a large academic institution. Data from February 16th, 2015- June 30th, 2015 was compared to data from February 16th, 2014 - July 1st, 2014. Comparative analysis included NIPPV use and duration, failure of NIPPV requiring endotracheal intubation, ED-ICU level of care changes (correlating to ICU admissions saved), as well as ED, ICU, and overall hospital length of stay (LOS) data.

Results: Overall use of NIPPV in the emergency department has remained stable between 2014 (n=162) and 2015 (n=150). In-hospital mortality rates for patients requiring NIPPV also remained stable. Meanwhile, the number of ICU admissions for patients requiring treated with NIPPV in the emergency department dropped significantly (121/162 vs 57/150) with an absolute risk reduction of 0.367 (95%CI 0.259-0.462) and a NNT of only 3. There was a strong, albeit nonsignificant, trend toward decreased NIPPV failure requiring intubation with a relative risk reduction of 0.337 (95%CI -0.0709-0.7846).

Conclusion: The EC3 model has led to significantly decreased ICU admissions for respiratory failure amenable to NIPPV, while overall use, NIPPV failure, and in-hospital mortality remained stable. Managing reversible causes of respiratory failure in an ED-ICU has high potential to benefit both patients and medical systems.

405 Super-SIRS: Evaluating the Efficacy of a Modified Approach to Identify High-Acuity, High-Risk Severe Sepsis and Septic Shock Patients at Triage

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Background: SIRS criteria have been shown to have poor specificity and positive predictive value (PPV) in identifying potential severe sepsis and septic shock (SS/SS) patients requiring immediate intervention in the ED. ED physicians at North Shore-LIJ Health System developed a "Super SIRS" (S-SIRS) triage approach to expedite identification and intervention for patients at high risk of meeting SS/SS criteria in the ED.

Objectives: To determine the PPV of S-SIRS for identifying SS/SS patients in the ED, and to assess the difference in time zero between a S-SIRS approach and usual, diagnostic laboratory procedures.

Methods: Review of patients with SS/SS diagnosis entered into a quality improvement database over a 3.5 yr period. *Setting*: 4 urban tertiary care and 4 community hospitals in the New York metropolitan area. S-SIRS is defined as a possible/suspected infection + ≥ 2 of the following: pulse ≥ 120, respiratory rate ≥ 24, sBP < 90 mmHg, temperature ≥ 101°F or ≤ 96.8°F, or acute altered mental status. *Inclusion criteria (*broad SS/SS criteria): ≥ 2 SIRS criteria + lactate ≥ 2.2mmol/L or sBP < 90 mmHg or organ dysfunction. *Exclusion criteria*: < 18, advance directive precluding bundle, interventions declined. *Study Assessments*: Sensitivity and PPV were assessed with chi square test. Median triage to lactate result time was determined by log rank test.

Results: 6,890/21,330 (32.3%) of SS/SS patients met S-SIRS criteria at triage. 5,532/6,890 patients met both S-SIRS at triage and broad SS/SS criteria. 13,849/14,440 patients who did not meet S-SIRS criteria did meet broad SS/SS criteria. PPV = 80.29%; Sensitivity = 28.54%, p <0.0001. 3,153/6,890 patients who met S-SIRS at triage had lactate ≥4.0mmol/L and 3,482/14,440 patients who did not meet S-SIRS at triage had lactate ≥4.0mmol/L. PPV = 45.76%, Sensitivity = 47.52%, p < 0.0001. Median triage to lactate result time (S-SIRS v no S-SIRS): 74 minutes (CI: 73, 75) v 85 minutes (CI: 84, 86), p < 0.0001.

Conclusion: A Super-SIRS tool employed at triage may have utility in identifying SS/SS patients at triage and in facilitating earlier intervention by establishing an earlier "time zero" for this high-risk population.

406 Sentinel Visits in Emergency Department Patients with Diabetes Mellitus as a Warning Sign for Hyperglycemic Emergencies

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Background: Patients with poorly controlled diabetes mellitus (DM) often visit the emergency department (ED) for management of hyperglycemia, diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS). Many of these patients have a "sentinel" ED visit for other medical conditions prior to their hyperglycemic visit, which may worsen their glucose control.

Objectives: The objective of this study was to describe the epidemiology and outcomes of patients presenting with a sentinel ED visit prior to their visit for a hyperglycemic emergency.

Methods: This was a health records review of patients ≥18 years presenting to one of four tertiary care EDs (combined annual census 300,000) with a discharge diagnosis of DM, hyperglycemia, DKA or HHS in a one-year period. Trained research personnel collected data from medical records including demographics, clinical history and results of investigations. Electronic charts were reviewed to determine if the patient came to the ED within the prior 14 days of their index hyperglycemia visit, and the details and outcomes surrounding both visits. Descriptive statistics were used where appropriate to summarize the data.

Results: From January-December 2014, 609 ED visits had a discharge diagnosis of hyperglycemia. Mean (SD) age was 50.4 (19.5) years, and 343 (56.3%) were male. 101/609 visitors (16.6%) had an ED presentation within the previous 14 days from their hyperglycemia visit. 71 (70.3%) of these were discharged from this initial visit and 49/71 (69.0%) were discharged either without their blood glucose checked or with an elevated blood glucose (>11.0 mmol/L). Of the sentinel visits, 58 (57.4%) were for hyperglycemia and 15 (14.9%) were for infection.Upon returning to the ED, 45/101 (44.6%) were subsequently admitted for management of severe hyperglycemia, DKA or HHS.

Conclusion: This unique ED-based study demonstrates that patients with DM presenting with hyperglycemia or infection often return and may ultimately require admission. Clinicians should be vigilant in checking blood glucose when these patients present to the ED and provide clear discharge instructions for follow-up and glucose management. Future research should focus on improving glycemic control in these patients in order to prevent further hyperglycemic emergencies from occurring.

407 Which Score is Better—HEART vs. EDACS-ADP?

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Background: An important issue in the emergency department (ED) is the efficient identification of patients presenting with chest pain who are low risk for acute coronary syndrome (ACS) and are safe to discharge with minimal testing or intervention. Clinical chest pain risk scores may aid the emergency physician in ruling out ACS in patients presenting with chest pain.

Objectives: The primary objective was to compare the ability of the HEART and Emergency Department Assessment of Chest pain Score-Accelerated Diagnostic Protocol (EDACS-ADP) scores to identify ED patients presenting with chest pain who are low risk for AMI or death and safe for discharge. The secondary objective was to investigate the ability of these scores to identify coronary artery disease (CAD).

Methods: We reviewed a convenience sample from the prospective PREVENCIO biomarker dataset of patients presenting to the ED with suspected ACS. HEART and EDACS-ADP scores were calculated for each patient. Patients were classified as low risk and safe for discharge if their HEART score was ≤ 3 or they met the low risk criteria of the EDACS-ADP. Incident death or STEMI were excluded from this analysis. The gold standard diagnosis was determined by 30-day chart review or telephone contact. Risk score performance is presented as sensitivity, negative predictive values, and the proportion of patients identified as being low risk by each score.

Results: Overall, 199 patients had risk stratification with the HEART and EDACS-ADP. The mean age was 53±9.4, 58% were male, 14%, 31%, and 48% were white, Hispanic, and African American, respectively. Within 30 days of discharge, there was 1 (0.5%) death, 28 (14.1%) AMI, and 36 (18.1%) with CAD. The HEART score and EDACS-ADP identified 38 (19.1%, 95%CI 13.64-24.56) and 119 (59.8%, 95%CI 52.99-66.61) as low risk and safe for discharge, respectively. In the low risk groups, 3 of 38 (7.9%, 95%CI 1.65-21.4) HEART score, vs 3 of 119 (2.5%, 95%CI 0.52-7.2) EDACS-ADP suffered an AMI or death (3 AMI for HEART score and 2 AMI, 1 death for EDACS-ADP).

Conclusion: The EDACS-ADP identifies three times more patients as low risk and safe for discharge than the HEART score, with statistically similar 30 day AMI and mortality rates.

408 Reliability of Clinical Assessments in Older Adults with Syncope or Near Syncope in the ED

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Table 407
Rodriguez: Test performance of each risk score

Risk Score	% identified as low risk and safe for discharge (95% CI)	AMI or Death Sensitivity (95% CI)	AMI or Death Negative Predictive Value (95% CI)	Number of AMI or deaths in patients identified as low risk and safe for discharge	CAD Sensitivity (95% CI)	CAD Negative Predictive Value (95% CI)	Number identified as low risk and safe for discharge with CAD
HEART	19.1 (13.64-24.56)	89.7 (72.65-97.81)	92.1 (78.62-98.34)	3/38 (7.9%, 95%CI 1.65-21.4)	91.7 (77.53-98.25)	92.1 (78.62-98.34)	3/38 (7.9%, 95%CI 1.65-21.4)
EDACS-ADP	59.8 (52.99-66.61)	89.7 (72.65-97.81)	97.5 (92.81-99.48)	3/119 (2.5%, 95%CI 0.52-7.2)	75.0 (57.80-87.88)	92.4 (86.13-96.48)	9/119 (7.6%, 95%CI 3.52-13.9)

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Table 408
Nishijima: Agreement of Clinical Variables

Characteristic *	Kappa ≥ 0.60	Kappa < 0.60
Past Medical History	Pacemaker, EF<40%, CAD, structural heart disease, DM requiring meds, defibrillator, prior stroke/TIA, dementia, arrhythmia, CHF, renal insufficiency, seizure disorder, HTN requiring meds	Peripheral vascular disease
Current Medications	Beta blockers, calcium channel blockers, diuretics	Alpha blockers, other antiarrhythmic agents
Physical Examination	None	Heart murmur, positive fecal occult blood, abnormal gait, unilateral weakness, speech disturbance
ECG Interpretations	Complete LBBB, right axis deviation, multiple PVCs, complete RBBB	Left axis deviation, non-sinus rhythms, LVH, acute or chronic ischemic changes, prolonged QTc, first degree heart block, prolonged QRS, isolated/ nonspecific ST/T abnormalities

*included if ≥ 1%; variables < 1% present: family premature death, congenital heart disease, carotid bruit, double vision, change in facial sensation, facial drooping, abnormal cerebellar testing, sinus bradycardia, RVH, short PR interval, Brugada pattern, delta wave

Background: Clinical prediction models for risk stratification of older adults with syncope may improve resource utilization and management. Variables considered for inclusion into such models must be reproducible and reliable.

Objectives: Our objective was to evaluate the reproducibility and reliability of clinical variables in older adults undergoing ED evaluation for syncope.

Methods: We conducted a cross-sectional study at 11 EDs in adults 60 years or older who presented with unexplained syncope or near syncope. We excluded patients with a presumptive cause of syncope (e.g. seizure), or if they were unable or unwilling to follow-up. Independent, blinded evaluations of the patient's physical examination and ECG interpretation were completed by attending/resident, attending/midlevel provider, or attending/attending pairs. Evaluations of the patient's past medical history and current medication use were completed by treating provider and trained research associate pairs. We calculated the kappa statistic for binary variables and reliability was considered acceptable if the kappa statistic was 0.6 or higher.

Results: We obtained paired observations for 253 patients; mean age was 73 years (SD 9 years), 137 (54%) were male, 205 (80%) were admitted to the hospital, and 13 (5%) had a 30-day death or serious cardiac outcome. Acceptable agreement (calculated in variables present ≥ 1%) was achieved in 13 of the 14 (93%) past medical history variables, 3 of the 5 (60%) current medication variables, 0 of the 5 (0%) physical examination variables, and 4 of the 12 (33%) ECG interpretation variables (Table).

Conclusion: Acceptable agreement between raters was more commonly achieved with historical variables than with physical examination or ECG interpretation variables. Future development of clinical prediction models in older adults with syncope should account for variability of assessments between raters and consider the use of objective clinical variables.

409 Ibutilide-Induced Ventricular Tachycardia in the Community Emergency Department Setting: Incidence and Risk Factors

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Background: Ibutilide is effective in the cardioversion of atrial fibrillation (AF) and flutter (AFL) but carries a risk of ventricular tachycardia (VT). In a large meta-analysis, the incidence of monomorphic and polymorphic VT was each about 4%, occurring predominately in patients with systolic heart failure (sysHF). The risk profile of ibutilide recipients in community ED practice is unknown, as is the rate of VT.

Objectives: We sought to evaluate the incidence of VT within 4 hours of ibutilide infusion and the prevalence of VT risk factors: sysHF (ejection fraction <40%), uncorrected serum potassium (K) <3.5 mEq/L and magnesium (Mg) <1.7 mEq/L, and a prolonged QTc interval >480 ms.

Methods: We analyzed a retrospective cohort of adults who received ibutilide between 1/2009 and 6/2015 in 21 community EDs with no ibutilide clinical care pathways in place. We gathered demographic and clinical variables from both electronic and structured manual chart review and measured inter-rater agreement for sysHF, QTc, and VT in a random selection of 10% of patients. We calculated descriptive statistics and described risk factors and treatment of VT cases.

Results: The cohort of 361 patients had a median age of 61 years and 142 (39.3%) were female. These patients had 414 qualifying ED visits: 337 (81.4%) with isolated AF, 77 (18.6%) with AFL ± AF; 408 (98.6%) visits were for recent-onset AF/FL with symptoms <48 hours. 211 cases (51%) received one 10-minute infusion of ibutilide (usually 1 mg) and

203 (49%) went on to receive a second infusion. Among the cases, incidence of unmeasured K and Mg was 1.7% (n=7) and 37.0% (n=153), respectively. We found 100% agreement on inter-rater measures. Non-ECG risk factors were uncommon: sysHF, 0.7% (n=3); low K, 2.9% (n=12); and low Mg, 3.1% (n=13). Prolonged QTc was common: 28.7% (n=119). Two cases of VT occurred (0.5%; 95% CI 0.01% to 1.9%), both during the second ibutilide infusion: one patient without risk factors had a 3-beat run of monomorphic VT and another with an uncorrected K level of 3.1 mEq/L had sustained runs of stable polymorphic VT. The latter resolved within 15 min with IV $MgSO_4$ and IV amiodarone.

Conclusion: Ibutilide-induced VT was uncommon in this community AF/FL population with a low prevalence of sysHF and electrolyte abnormalities, despite the high rate of prolonged QTc.

410 Prevalence of Renal Dysfunction Among Observation Patients with Chest Pain and Impact on Patient Outcomes

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Background: Previous studies have demonstrated increased risk of acute coronary syndrome (ACS) and positive diagnostic testing among patients with chest pain and renal dysfunction.

Objectives: We evaluated the prevalence of renal dysfunction among chest pain patients in the emergency department observation unit (EDOU) and the impact of renal impairment on EDOU testing outcomes and inpatient admission rates.

Methods: We conducted an 18-month prospective evaluation of patients evaluated in the EDOU for chest pain. We collected baseline information as well as data from the ED visit, EDOU stay, inpatient admission, and the 30-day period following presentation to the ED. We estimated glomerular filtration rate (GFR) using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. We stratified patients by GFR<60 and <90 mL/min per 1.73 m(2) We evaluated the primary outcome of myocardial infarction (MI), stent, or coronary artery bypass graft (CABG) as well as rates of positive or indeterminate provocative cardiac testing and inpatient admission.

Results: Of the 569 patients enrolled during the study period, 53% were female and average age was 53.8 years. 49.8% of patients had at least mild renal dysfunction (GFR<90) and 10.2% of patients had at least moderate renal dysfunction (GFR<60). Differences in the rate of MI, stent, or CABG were not significant at a cut-off of GFR<90 (3.3% vs. 1.7%, p=0.281) nor at a cutoff of GFR<60 (1.7% vs. 2.6%, p=1.000). 46.2% of patients had provocative cardiac testing performed during the EDOU stay, and we did not find significant differences in the rates of positive or indeterminate testing at cutoffs of GFR<90 (5.8% vs. 3.4%, p=0.151) nor GFR<60 (1.7% vs. 4.9%, p=0.348). Finally, inpatient admission rates were not significantly higher for those with depressed renal function (GFR<90: 12.9% vs. 8.8%, p=0.259; GFR<60: 15.5% vs. 10.2%, p=0.213).

Conclusion: For patients with chest pain in the EDOU, we noted a high prevalence of at least mildly reduced renal function. However, these patients did not have significantly higher rates of ACS, positive testing, or inpatient admission. Our findings validate those of a previous retrospective study demonstrating that patients with renal dysfunction may be safely and effectively evaluated in the EDOU setting.

411 Patients On Beta-blockers Do Not Require More Than One Dose of Epinephrine For Anaphylaxis

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Background: The association between beta-blocker use and the risk of anaphylaxis severity or need for increased doses of epinephrine has not been established.

Objectives: Our study objective was to determine if there is an increased risk of requiring more than one dose of epinephrine for the treatment of anaphylaxis among emergency department (ED) patients on beta-blocker medications.

Methods: We conducted a single center, retrospective chart review of ED patients meeting diagnostic criteria for anaphylaxis on presentation to the ED. The primary outcome measure was the number of doses of epinephrine required regardless of administration site (pre-hospital, ED, or ED observation unit) or route for management of anaphylaxis. Associations with repeat epinephrine administration (>1 vs ≤ 1 dose of epinephrine) and associations with any epinephrine administration (>0 vs 0) were evaluated using logistic regression models and summarized with odds ratios and 95% confidence intervals (CIs). The study was powered to detect a 10% or greater difference in need for repeat epinephrine administration.

Results: A total of 789 patients were included in the study. The median patient age was 34 years (IQR 18-53) and 466 (59%) were female. Overall 63 (8%) patients required repeat epinephrine administration and 83 (11%) were on beta-blockers. A total of 8 (10%) patients on a beta-blocker required more than 1 dose of epinephrine compared with 55 (8.1%) of patients not on a beta blocker, OR 1.26 (95% CI 0.58-2.75). In addition, we determined if patients on a beta-blocker were more likely to require any epinephrine when compared to patients not on a beta blocker. A total of 41 (49%) patients on a beta-blocker required at least one dose of epinephrine compared with 405 (57%) of the patients not on a beta-blocker, OR 0.73 (95% CI 0.46-1.14). Thus, the use of a beta-blocker medication was not associated with the need for repeat epinephrine administration in patients with anaphylaxis.

Conclusion: Although prior publications have associated beta-blocker use with markers of increased anaphylaxis severity, we did not find a significant increase in the need for repeat epinephrine dosing among patients on beta-blockers.

412 Predictors of Ibutilide Effectiveness in the Cardioversion of Atrial Fibrillation and Flutter in the Community Emergency Department Setting

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Background: The efficacy of ibutilide in the cardioversion of recent-onset (<48 hours) atrial fibrillation (AF) and flutter (AFL) ranges from 50% to 70% in clinical trials. Pre-treatment with high-dose IV $MgSO_4$ (≥4 grams) can increase the rate of cardioversion up to 85%, but lower doses have not been successful. The effectiveness of ibutilide in the community ED setting has not been well described.

Objectives: We sought to evaluate the rate of cardioversion 4 hours after ibutilide infusion. We determined the association of candidate predictor variables with cardioversion: older age (≥65 years), female sex, AFL (vs isolated AF), newly diagnosed AF/AFL, and pre-ibutilide IV $MgSO_4$ treatment.

Methods: We analyzed a retrospective cohort of adults who received ibutilide between 1/2009 and 6/2015 in 21 community EDs with no ibutilide clinical care pathways in place. We gathered demographic and clinical variables from both electronic and structured manual chart review and measured inter-rater agreement for new diagnosis, $MgSO_4$ pre-treatment, and cardioversion in 12% of randomly selected patients.

We used multivariate regression analysis to estimate adjusted odds ratios (ORs) of the candidate predictors of cardioversion.

Results: The cohort included 361 patients with a first qualifying ED visit. Median age was 61 years (IQR, 53-71). Nearly all patients (354; 98.1%) had recent-onset AF/AFL. The mean ibutilide dose was 1.5 (± 0.5) mg. Low dose $MgSO_4$ (1-2 grams) was given to half the patients (50.4%). Only two patients (0.6%) received high-dose $MgSO_4$. Overall, 198 cases (54.8%) cardioverted. Rates of predictor variables and adjusted ORs are reported in the Table. We found 100% agreement on inter-rater measures.

Conclusion: Ibutilide cardioverted 55% of ED patients with AF/AFL. Older age, AFL rhythm, and new diagnosis were independently associated with ibutilide effectiveness, whereas patient sex and any-dose $MgSO_4$ were not. High-dose $MgSO_4$ was underutilized.

Lugovskaya Table. Adjusted association of variables with ibutilide effectiveness at 4 hours

Variable	Rate N=361 n (%)	Adjusted Odds Ratio (95% CI)	P Value
Age ≥65 years (vs <65 years)	153 (42.4)	2.2 (1.4, 3.6)	0.001
Female (vs male)	142 (39.3)	1.3 (0.8, 2.1)	0.288
AFL (vs AF)	64 (17.7)	2.6 (1.4, 4.9)	0.004
New diagnosis (vs history of AF/AFL)	147 (40.7)	2.0 (1.2, 3.1)	0.004
Any $MgSO_4$ (vs none)	184 (51.0)	1.0 (0.7, 1.6)	0.844

413 The Effect of Nebulized Albuterol on Serum Lactate and Potassium in Healthy Subjects

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Background: Clinical observation and case reports suggest that albuterol may increase the serum lactate level, but randomized trials supporting this effect are lacking. As emergency physicians increasingly use lactate as a screening test for shock, it is more important than ever to explore the relationship between albuterol and lactate.

Objectives: To determine if nebulized albuterol causes an increase in the serum lactate level compared to placebo. Second, to confirm that albuterol decreases serum potassium levels compared to placebo in patients with normokalemia.

Methods: This was a randomized, double-blind, placebo-controlled trial. Twenty-eight healthy adult volunteers were assigned to receive either 10 mg of nebulized albuterol or placebo (nebulized saline) over one hour. Serum lactate was measured prior to treatment and at 30 minutes and 70 minutes after the start of treatment. Serum potassium level was measured prior to treatment and at 70 minutes. Measurements were made using the i-STAT 1 analyzer. The primary outcome was the degree of change in lactate level. The secondary outcome was the degree of change in potassium level.

Results: In the 14 subjects who received albuterol, the average increase in lactate was 0.77 mmol/L [95% CI 0.52 to 1.02 mmol/L], and the average decrease in potassium level was 0.5 mEq/L [95% CI -0.72 to -0.28 mEq/L]. Amongst the subjects who received placebo, the lactate level decreased by 0.15 mmol/L [95% CI -0.39 to 0.09 mmol/L] and there was no change in potassium level at (0.0 mEq/L [95% CI -0.21 to 0.21 mEq/L]). These differences between the albuterol and placebo group are statistically significant (P = 0.000020 and P = 0.0027, respectively).

Conclusion: Nebulized albuterol increases lactate levels and decreases potassium levels in healthy aults.

414 Appropriateness of Rapid Sequence Intubation Medication Doses in Obese vs. Non-Obese Patients

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Background: Obesity is associated with increased complications during airway management. There are limited data regarding the appropriateness of sedative and paralytic dosing of obese patients undergoing rapid sequence intubation (RSI) in the ED.

Objectives: Aim of this study was to compare rates of appropriate succinylcholine and etomidate doses in obese and non-obese patients.

Methods: Retrospective review using a database of patients undergoing RSI in an urban, tertiary care academic ED, from January to December 2011. Dosing for succinylcholine and etomidate were calculated as milligram per kilogram of total body weight (TBW) for each patient, defining appropriate dosing as succinylcholine 1-1.5 mg/kg TBW and etomidate 0.2-0.4 mg/kg TBW. Logistic regression analysis was used to estimate the association between appropriate dosing and World Health Organization body mass index classification. Odds ratio (OR) was calculated to determine likelihood of over- or under-dosing of obese or non-obese patients. Subgroup analysis was performed for each class of obesity.

Results: 440 patients were included in the study; 311(70.7%) classified as non-obese and 129 (29.3%) as obese. 233 (56%) received an inappropriate succinylcholine dose and 107 (24%) received an inappropriate etomidate dose. Obese patients were more likely to be underdosed with succinylcholine (OR 63.7; 95% CI 17.8-228.1), and with etomidate (OR 178.3; 95% CI 37.6-844.7) compared to non-obese patients. Non-obese patients were more likely to be overdosed with succinylcholine and etomidate compared to obese patients (OR 76.9; 95% CI 26.3-200). In subgroup analysis, Class I and II obesity were less likely to be overdosed with succinylcholine and etomidate compared to normal weight patients (OR: 27.8, 95% CI 2.9-250; OR: 250, 95% CI 29.4-1000, respectively). There was no significant difference in Class III obese and underweight patients.

Conclusion: Obese patients were more likely to be underdosed with RSI medications compared with non-obese patients, while non-obese patients were more likely to be overdosed with RSI medications. The majority of obese and non-obese patients were inappropriately dosed with RSI medications, suggesting that physicians are not dosing these medications based on weight.

415 Does Obesity Increase the Rate of Central Venous Catheter-Associated Mechanical Complications?

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Background: The use of central venous catheters (CVCs) is associated with several mechanical complications. Currently, two-thirds of the U.S. population is considered overweight or obese. The impact of body mass index (BMI) on the risk of mechanical complication during CVC placement is unclear.

Objectives: Our objective was to determine if there is an increased incidence of mechanical complications in obese patients. We hypothesized that obesity is associated with increased incidence of mechanical complication.

Methods: Retrospective analysis of previously collected data gathered from a large retrospective chart review at two teaching hospitals, hospital 1, from 11/1/12 - 6/31/13 and hospital 2, from 11/1/12 - 7/31/13. BMI was calculated for each patient who was then categorized based on the NIH BMI classification. Lines were categorized into one of two groups: patients with underweight or normal BMI, and patients with overweight or obese BMI. Mechanical complications considered were: pneumothorax, hemothorax, retained guidewire, PE/DVT, and arterial injury from femoral, subclavian and internal jugular CVC insertions. Fisher's exact test was used to compare BMI class complication rates.

Results: 1,231 CVCs in 801 patients were analyzed; approximately 688 CVCs from hospital 1 and 543 CVCs from hospital 2. Lines placed in underweight and normal BMI individuals had a 5% rate of mechanical complications, while lines placed in overweight and obese individuals had a 3% rate of mechanical complications. Although no statistically significant difference between these groups was found, the data trended towards obese and overweight individuals having a lower rate of mechanical complications (p=0.059).

Conclusion: Our data suggests there is no association between BMI and rate of mechanical complications. The results also suggest that overweight and obese individuals may have a protective factor over underweight and normal weight individuals, which should be considered for further investigation. Further analysis should also evaluate if BMI has associations with any specific mechanical complications.

416 The Decision to Admit: Factors Influencing ED Admission

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Background: The decision to admit is a common and costly decision made daily by emergency providers. A more clear understanding of the factors contributing to this decision could lead to a reduction in hospitalizations and potentially lower healthcare costs.

Objectives: This study examines how specific variables ranging from patient characteristics to effects from the surrounding community impact ED admission rates.

Methods: We conducted a retrospective, cross-sectional study using two years of billing records from LogixHealth. We calculated hospital-level admission rates, adjusting for age, sex, primary diagnosis, case-mix [using the ten most common diagnoses as independent covariates], provider license level, annual ED volume, hospital type, and hospital ownership. Additionally we adjusted for the following factors measured at the county level: per capita income, uninsured rate [age <65], the number of primary care providers and urbanicity. We evaluated the influence of each factor on the odds of hospital admission using multivariate logistic regression.

Results: We studied 1,412,300 patient encounters from 18 hospital sites in eight states. A number of factors were associated with an increased odds of hospital admission (Table) including advancing age, male sex (OR 1.20), and patients seen by a MD or DO versus a mid-level provider (OR 2.26). At a hospital level, there was an increased odds of admission with rising ED volume. The odds of admission were higher at academic institutions (OR 2.23) and at for-profit hospitals as compared to non-profit facilities (OR 1.15). The admission rate was lower in communities with a higher per capita income, a higher rate of uninsured patients and among more urban hospitals. In communities with the most primary providers there was a lower odds of admission.

Conclusion: We identified factors that influence the decision to admit. While some factors cannot be changed (i.e. an aging population), the lower admission rate in hospitals with surrounding communities with more resources, represented by a higher number of primary providers and higher per capita income, suggests some targets for intervention. Enhancing community services and access to care could reduce ED admissions.

Factors Associated with Hospital Admission, measured at the county level

Community Factors	Odds Ratio	95% CI
Per Capita Income (reference group $10,000-$29,999)		
$30,000-$49,999	0.87	(0.86, 0.89)
$50,000-$70,000	0.82	(0.80, 0.84)
Persons < Age 65 Without Health Insurance (reference group 0-6.9%)		
7-13.9%	0.67	(0.66, 0.68)
14-20.9%	0.67	(0.67, 0.68)
Number of Primary Care Providers (reference group 0-99, no significant difference 500-1499)		
100-499	0.94	(0.92, 0.97)
1500-2500	0.6	(0.57, 0.62)

Table 416: Honigman Warner.

417 The Gillette Stadium Experience: A Retrospective Review of Mass Gathering Events from 2010-2015

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Background: Mass gathering medicine is a relatively new area of study which encompasses events that have the potential to significantly affect local pre-hospital care and hospital emergency services. Most literature on this topic consists of case studies of individual events. There is little published material describing the patient populations seen at large capacity venues hosting many multi-genre mass gathering events per year. Gillette Stadium has a maximum capacity of 68,756 and hosts 40-50 events each year including professional sports, collegiate sports and musical concerts. Each of these events generates a diverse patient population, making medical planning for such venues difficult for on-site medical staff and local EMS partners.

Objectives: To analyze patient presentations and medical staffing coverage needed at Gillette Stadium across multi-genre events from 2010-2015 and compare populations between different event types.

Methods: Patient records for medical care delivered inside Gillette Stadium and ambulance transport records (recorded and maintained by the Foxborough Fire Department and Fallon Ambulance Service) were merged and analyzed with regard to event type, attendance, presentation rates, chief complaints and ambulance transports.

Results: From 2010-2015, Gillette Stadium hosted 261 events drawing 7,857,576 patrons and generating 8,283 medical contacts. Women (60.2%) made up the majority of contacts. The overall patient

Patient Demographics

Gender (female)		60.2%
	Trauma (female)	55.2%
	Transport (female)	49.5%
Age (years)		32 (0.58 - 94)
	Trauma (years)	33 (1 - 94)
	Transport (years)	35 (2 - 88)

Table 417: Maggin.

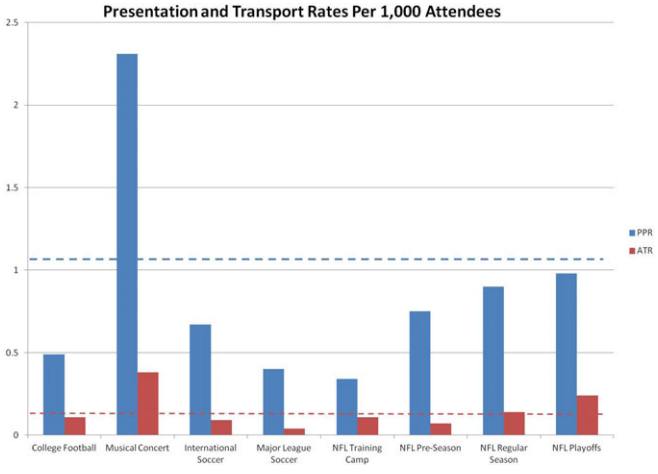

Figure 417 – Maggin

presentation rate (PPR) and ambulance transport rate (ATR) per 1,000 attendees were 1.05 and 0.17 respectively, but both varied by event type with concerts generating the highest value in both categories (PPR 2.31; ATR 0.38). Traumatic injury accounted for 29.6% of presentations, again varying across event type (21.7%-45.9%).

Conclusion: Most patient presentations were minor, allowing patrons to return to the event after seeking in-venue medical care. Patient presentation and ambulance transport rates varied widely across different genres of events, indicating the need for on-site medical staff to develop different medical coverage plans based on event type. Further analysis of multi-genre mass gathering event venues will help to identify key variables between different types of events to ensure exceptional medical care is delivered to attendees.

418 Creating Pediatric Hospital Surge Capacity with Reverse Triage

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Background: During disasters, hospitals are expected to be self-sufficient for a minimum of 96 hours. Reverse triage, the practice of safely discharging patients with a low risk of having an untoward event, has been documented to be the most effective strategy for increasing hospital capacity for adult patients during disasters or crowding. However, the practice of reverse triage has not been examined in pediatric populations.

Objectives: We examined the potential of reverse triage on pediatric surge capacity and identied pediatric characteristics associated with reverse triage eligibility.

Methods: This retrospective study was conducted at a 181 bed tertiary children's center. Over 12-months ending Dec 2013, mock disasters dates were randomly assigned. Guided by sample size considerations, every 8th patient on 7 units (5 medical/surgical; 1 psych; 1 PICU) were selected for reverse triage analysis. Patients were considered eligible for reverse triage if they did not receive any critical interventions (CIs) within 96 hours of the mock disaster onset. Previously published CIs were used for reverse triage criteria. Logistic regression was used to calculate Odds Ratio for associations.

Results: Of 501 patients, 47% were female, 53% male, 38% Black, 43% White, and 19% of other race. The mean age was 7.8 years old and the median length of stay was 10 (1-327) days. Most pediatric patients were admitted through the ED (39.7%), followed by elective admission (34.9%), outside transfer (19.2%), and admission at birth (5.8%). For all floors combined, proportion of patients eligible for reverse triage on post-disaster day 1 to 4 were 20%, 32%, 42%, 50%, respectively. Psychiatry was able to create 82% new capacity within the first day. The PICU could not create any capacity from an early discharge strategy within 24 hours and only 14% by day 4. The Med/Surge units were able to create capacity of 22% within a day and 61% within 4 days. Older age (OR = 1.43) was associated with early discharge eligibility.

Conclusion: Reverse triage may be a viable strategy for increasing pediatric hospital surge capacity without increasing resources during disasters or times of hospital crowding. Direct reverse triage is not feasible for ICUs, but these units may still realize a benefit from med/surg bed capacity creation.

419 Priorities of Care Among Emergency Department Patients with Low Acuity Chief Complaints

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Background: Up to two thirds of ED patients have chief complaints suggestive of low acuity conditions. While many prior studies have evaluated the safety and feasibility of diverting these patients to outpatient settings, very few studies have examined the expectations and priorities these patients have while in the ED. In order to provide optimal care for these patients and to meet payers' increasing emphasis on patient satisfaction, there is a need to better explore these patients' goals of care.

Objectives: The purpose of this study is to understand what motivates patients with lower acuity chief complaints to visit the ED, and the factors they use to define a successful visit. We hypothesized that patients would prioritize convenience and adequate pain treatment.

Methods: This prospective, cross-sectional study was based in an urban, academic ED. Construct validity of the study questionnaire was established through review by a panel whose members had expertise in emergency department care, barriers to healthcare access, and urban health. Eligible ED patients had ESI scores of 4 or 5. Subjects under the age of 18, and those with dementia or intoxication were excluded. Participants were enrolled using random time-block sampling to limit selection bias. Trained research assistants approached eligible patients during randomly selected two hour blocks between 9 am and 10 pm, 7 days per week. Participants were asked about reasons for the ED visit, visit priorities, and medical, social, and psychological barriers to care.

Results: Of 856 patients approached, 441 (51.5%) answered the survey. Most (63%) had fewer than 3 ED visits during the prior year, and 71% had a primary care physician. 58% reported severe pain at the time of their visit, and 22% had moderate pain. Patients cared most about obtaining pain relief (N=221, 50%) and determining their diagnosis (N=137, 31%). Few patients prioritized ruling out acute life threats (N=32, 7%) or arranging outpatient follow-up (N=7, 2%). Participants considered it important or very important to obtain help with smoking cessation (22%), and cessation of drug (14%) or alcohol use (12%).

Conclusion: Acute pain was common among these patients with lower acuity chief complaints, and patients prioritized adequate pain control. A small but significant proportion of patients are motivated to obtain help with substance abuse cessation.

420 Clinical Care at U.S. Freestanding EDs: Results of a National Survey

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Background: Freestanding EDs (FSED) provide emergency care remote from an acute care hospital. The number of FSEDs has increased rapidly, yet there is not national data on FSEDs.

Objectives: To determine operational and quality metrics of care at FSEDs in the U.S.

Methods: We conducted a survey of U.S. FSEDs from in 2015. The instrument was developed by content experts in EM and health policy, and revised based on a 4 site pilot. The sample frame was a national inventory of FSEDs (N=345). We divided states into 3 strata: 22 states with <6 FSEDs, 6 states with 9-33 FSEDs, and Texas (170 FSEDs). We sampled 245 FSEDs. We mailed surveys to the medical director, business or operations managers up to 4 times and phoned or emailed non-respondents. We calculated nationally representative estimates accounting for sampling and differential non-response across strata. We used tests for equality of means and proportions to compare results for Texas to the rest of the states.

Results: We received a 60% (147/245) response rate overall; 73.6% (48/65) for states with <6 FSEDs, 54.4% (43/79) for states with 9-33 FSEDs, and 55.5% (56/101) for Texas. The table shows clinical capabilities; * for p<.05 for TX vs. other states. FSEDs in Texas have faster turnaround times, but are less likely to have electronic health records, type O blood or to offer tPA for acute CVA. Patient transfer agreements are in place for surgery at 78.9% of FSEDs, psychiatric admission at 65.9% and hand injury at 70.6% with the primary transfer location the OR, psychiatric hospital, and ED respectively. Quality metrics are tracked for sepsis at 36.8% of FSEDs and for acute myocardial infarction transfer time at 89.1%. Compared to hospital-affiliated FSEDs, non-hospital-affiliated FSEDs report shorter length of stay metrics (door to doc 6.7 min v 20.1, P<0.01; total LOS 63.1 v 106.9, P<0.01), CT reads consistently within 1 hr (91.3% v 68.2%, P<0.01), having Type O blood (4.4% v 45.9%, P<0.01), and offering tPA for acute stroke on site (19.6% v 85.5%, P<0.01). For-profit FSEDs have similar patterns as non-affiliated FSEDs.

Conclusion: Overall FSED service times are faster than hospital-based EDs. FSEDs in Texas, non-hospital-affiliated FSEDs, and for-profit FSEDs have faster service times, but are less likely to have several capabilities that are typically available at hospital EDs.

421 Emergency Department Utilization and Hospital Readmission Following Major Surgical Procedures in the United States

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Background: Reliable strategies for reducing hospital readmissions remain elusive despite financial penalties and public reporting efforts. While avoiding unnecessary emergency department (ED) visits after hospital discharge may be one approach for preventing readmissions, the type of care delivered in the ED may be equally important.

Objectives: We investigated whether high readmission rates following common surgical procedures are associated more prominently with high rates of post-discharge ED visits or high rates of readmissions from the ED.

Methods: We performed a cross-sectional, retrospective analysis of national Medicare data (2008-11) of 1,881,400 patients at 3,025 hospitals who underwent 1 of 5 procedures: percutaneous coronary intervention, coronary artery bypass grafting, cardiac valve replacement, colectomy, and hip fracture repair. We stratified hospitals into quintiles based upon risk-adjusted, index-hospital, 30-day readmission rates and then compared ED visits and readmissions from the ED across these quintiles. Risk-adjustment accounted for age, sex, and comorbidities using regression models.

Results: Overall risk-adjusted readmission rates following the 5 procedures varied widely across the extremes of hospital quintiles (range, 3.0% to 17.0%, p < 0.001). EDs with either very-low or very-high risk-adjusted readmission rates had modest differences in rates of ED visits (11.3% and 14.6%, respectively). In contrast, the proportion of readmissions from the ED was nearly 3 times as high in EDs with very-high risk-adjusted readmission rates when compared with those with very-low rates (43.0% vs. 16.8%, p < 0.001). These findings were consistent across the 5 procedures.

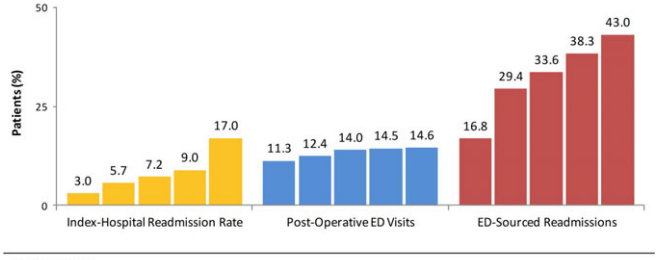
Conclusion: Some EDs appear better able to deliver care that prevents readmission following 5 common surgical procedures, despite experiencing similar rates of ED visit utilization. Reducing 30-day

Freestanding ED Clinical Care Characteristics

	Unadjusted Result (% or median [IQR])	Weighted National Estimate (mean)	States with <6FSEDs	States with 9-33 FSEDs	Texas
Door-to-Provider Time, mins. (average)	10.5 [3, 20.5]	13.0	19	12	4*
Overall Length of Stay, mins. (average)	99.9 [81, 131]	101.9	115	114.7	86.2*
% with Type O Blood Available	30.8%	26.0%	46.7%	47.6%	5.4%*
% with Mechanical Ventilator Available	85.3%	86.0%	80.0%	95.2%	82.1%
Electronic Health Records	92.3%	90.2%	100%	97.6%	82.1%*
% with Final CT Read Consistently Within 1 hr	77.6%	81.7%	62.2%	71.4%	94.6%*
Troponin Turnaround Time (Average)	15 [10,30]	19.9	28.9	27.4	12.5*
% Transferring Acute CVA Before Giving tPA	40.4%	46.9%	15.9%	29.3%	67.9%*

Table 420: Schuur.

Figure 1. Hospital Outcomes by Quintile of Index-Hospital Readmission Rate



In 3,025 hospitals.

Figure 421 – Dev

readmissions after hospital discharge may require greater attention to the type of care delivered in the ED.

422 Lack of Association Between ED Opioid Prescribing and Press Ganey Scores: A Single Center Study

Howard S. Kim[1], Patrick M. Lank[1], D. Mark Courtney[1], Bruce L. Lambert[1], Stephanie J. Gravenor[1], Peter S. Pang[2], and Danielle M. McCarthy[1]

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Background: Patient satisfaction is a key patient reported outcome that is increasingly linked to financial reimbursement. Despite the belief that providing an opioid prescription results in higher patient satisfaction scores, this association has not been well studied. A prior study investigated the association between inpatient opioids and Press Ganey (PG) scores, however, receiving an opioid prescription may differ.

Objectives: To determine if receiving an opioid prescription is associated with higher PG score.

Methods: We conducted a retrospective cohort study of subjects who completed a PG survey following an ED visit at a single urban academic ED in 2010 (annual volume: 80,000), linking these scores to clinical/demographic information from the electronic record. Overall PG scores were not normally distributed and were therefore stratified into quartiles, using the lowest quartile as the base for a multivariate multinomial logistic regression. The primary outcome was PG score quartile as a function of binary receipt of an opioid prescription, after controlling for confounders found to be significant on univariate analysis. A secondary analysis was then performed among the subset of patients receiving an opioid prescription. The secondary outcome was PG score quartile as a function of quantity of opioid prescription received, measured in both total morphine equivalents and pill quantity.

Results: Among 2,166 subjects who completed a PG survey, 12% were prescribed an opioid. The majority of subjects were white (68%) and female (65%). Overall PG scores were rightward skewed (median 4.6, IQR 4.0-4.9), reflecting high satisfaction scores on a scale from 1 to 5. On multivariate analysis, receipt of an opioid prescription was not significantly associated with increasing PG score quartile (Table 1). Male sex was positively associated with increasing PG score quartile, and door-to-doctor time was negatively associated with increasing PG score quartile. On subset analysis of patients receiving an opioid prescription, neither morphine equivalents nor total pill quantity prescribed were associated with increasing PG score quartile.

Conclusion: Contrary to popular belief, ED opioid prescribing was not associated with higher PG scores in this sample.

Table 1: Multivariate multinomial logistic regression of the odds of overall Press Ganey score quartile.

	Outcome: Overall Press Ganey Score Quartile, OR (95% CI)			
	Q1	Q2	Q3	Q4
Prescription Type				
None	Base	Ref	Ref	Ref
Non-Opioid	Base	0.58 (0.25-1.37)	0.47 (0.18-1.21)	0.29 (0.09-0.95)*
Opioid	Base	0.95 (0.66-1.39)	0.81 (0.54-1.20)	0.75 (0.50-1.13)
Sex				
Female	Base	Ref	Ref	Ref
Male	Base	1.48 (1.12-1.94)*	1.58 (1.19-2.09)*	1.64 (1.23-2.18)*
Race				
White	Base	Ref	Ref	Ref
Asian	Base	0.75 (0.41-1.39)	0.46 (0.22-0.95)*	0.46 (0.21-0.98)*
Black	Base	1.64 (1.16-2.33)*	1.26 (0.87-1.82)	1.96 (1.37-2.82)
Hispanic	Base	0.90 (0.54-1.48)	0.77 (0.45-1.30)	0.87 (0.50-1.49)
Door to Doctor (min)	Base	0.88 (0.85-0.92)*	0.84 (0.80-0.88)*	0.74 (0.71-0.78)*
Length of Stay (hr)	Base	0.97 (0.77-1.22)	0.97 (0.76-1.22)	0.72 (0.56-0.92)*
Acuity Level				
Emergent	Base	Ref	Ref	Ref
Urgent	Base	1.24 (0.89-1.72)	0.92 (0.66-1.29)	1.10 (0.78-1.55)
Semi-Urgent	Base	1.25 (0.85-1.86)	1.04 (0.70-1.55)	1.06 (0.71-1.59)
Non-Urgent	Base	1.68 (0.64-4.44)	0.63 (0.20-1.93)	0.97 0.35-2.68)

* p<0.05

Table 422: Kim.

423 Recreational Marijuana Legalization and Emergency Department Visits in Colorado

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Background: Marijuana legalization in Colorado (CO) proceeded in stepwise fashion: medical marijuana was liberalized in 2009, recreational marijuana was legalized in 2012, and retail sales began in 2014. This has resulted in increased tax revenue for the state and reports of a new phenomenon of marijuana tourism from out-of-state (OS) visitors.

Objectives: To determine if rates of cannabis-related ED visits have increased disproportionately in OS compared to CO residents after recreational marijuana legalization.

Methods: We conducted a cross-sectional study of an urban academic ED (University of Colorado Hospital, UCH; Aurora, CO; 100,000 annual visits) from 2012 to 2014, capturing the progression of CO from a medical marijuana to retail marijuana state. We compared the rates of ED visits with an ICD-9 diagnosis of cannabis use in OS vs CO residents, as determined by registration ZIP code. The number of cannabis related visits were corrected for annual ED volume by residency status and consecutive years were compared using a two-sample Z test of proportions. We then confirmed our findings using the same methodology in data from over 100 hospitals in the Colorado Hospital Association (CHA).

Results: At UCH, the rate of cannabis-related ED visits among OS residents doubled from 85 to 168 per 10,000 visits between 2013 and 2014, the first year of retail marijuana sales (Figure 1, 95% CI difference: 33-132 per 10,000 visits, p=0.001). Among CO residents, the

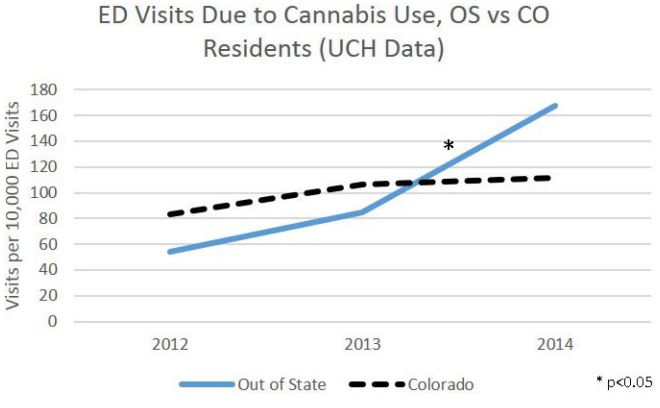

Figure 423 – Kim

rate of cannabis-related ED visits did not differ significantly between 2013 and 2014 (95% CI difference: -4 to 15 per 10,000 visits, p=0.26). CHA data demonstrated a similar increase in ED visits for cannabis use among OS residents, from 112 to 163 per 10,000 visits between 2013 and 2014 (95% CI difference: 39-120 per 10,000 visits, p<0.0001). Among CO residents, the rate of ED visits for cannabis use increased from 86 to 101 per 10,000 visits (95% CI difference: 12-17 per 10,000 visits, p<0.0001).

Conclusion: Cannabis-related ED visits appear to be increasing more rapidly in OS compared to CO residents. Initial educational efforts have focused on CO residents, however, additional education for OS visitors regarding safe usage of recreational marijuana products is needed.

424 Variations in Opioid Prescribing Behavior by Physician Training

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Background: EM physicians are often perceived to be the source of over-prescription of opioid analgesic medications. Patients often turn to the ED for treatment of a variety of painful conditions, many of whom are discharged with analgesic prescriptions.

Objectives: This study aimed to determine which type of providers in the ED prescribe opioid prescriptions in the largest quantities. We hypothesized that non-EM trained residents would prescribe the largest quantity of opioids while EM attendings would prescribe the smallest.

Methods: We performed a retrospective chart review of all patients discharged from the ED of a single tertiary care teaching hospital, over one academic year (7/1/2014-6/30/2015). The charts of all patients discharged with a prescription for opioid pain medications were included in this study. The quantity of opioids prescribed was reported in morphine milligram equivalent (MME) (median, IQR). Providers were grouped based on training and position: EM attendings, EM trained residents, and non-EM trained residents. Differences in prescribing quantities were tested using Kruskal-Wallis test, and pairwise comparisons were made using the Dwass-Steel-Critchlow-Flinger procedure.

Results: A total of 55,999 visits were reviewed, of which 4,431 were discharged with a prescription for an opioid medication. EM trained residents prescribed the least amount of opioid pain medications per prescription (75 MME, IQR 60-113), while non-EM trained resident providers prescribed the most (108 MME, IQR 75-150). EM attendings (90 MME, IQR 75-120) prescribed less than the non-EM trained resident providers, and more than EM trained residents.

Conclusion: EM providers, both residents and attendings, are less likely to prescribe large quantities of opioid analgesic medications than non-EM trained providers in the ED. EM attendings must be cognizant of prescribing patterns by residents to ensure that the prescription of opioid analgesic medications are appropriate.

425 State Legislation of Naloxone Use by Laypersons, First Responders, and EMT-Bs

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Background: Over the last two decades, deaths due to opiates have significantly increased with over 40,000 deaths attributed to opiates in 2013. Medication administration is controlled by statute or regulation in most jurisdictions. In 2013 there were only 16 States that allowed EMT-Bs to administer naloxone, despite studies demonstrating safe administration by both first responders and EMT-B.

Objectives: To describe current statutory/regulatory conditions for naloxone administration by laypersons, first responders (police and fire), and/or EMT-Bs throughout the United States.

Methods: A systematic review of state legislation to determine if naloxone administration by laypersons, first responders, or EMT-Bs is allowable under statute/regulation.

Results: Obtained current statute/regulation for all 50 states. 32 permit EMT-Bs to administer naloxone, 37 allow first responder administration, and 35 allow layperson administration. 9 states do not provide any statutory provision for administration of naloxone by any of the groups, while 27 states allow use by all groups. 9 states allow for both layperson and first responder use of naloxone, but do not permit EMT-B use of naloxone. 3 allow only EMT-B use of naloxone.

Conclusion: There has been a significant increase in legislation to allow naloxone use by laypersons, first responders and EMT-Bs. Given the epidemic of opiate abuse, coupled with the favorable safety profile of naloxone, the wide variability of legislation is intriguing. The variability among states could be due to their relative rates of opiate abuse. Interestingly, 9 states allow for both layperson and first responder use of naloxone, but not EMT-B, even though the latter have more training and medical education. One limitation of the study is that delegated practice states jurisdictions may not require legislation/regulation to allow first responder or EMT-B use of naloxone. Future research should evaluate the effectiveness of expanding naloxone use to laypersons, first responders and EMT-Bs on mortality rates from opiate overdose.

426 A Bibliometric Analysis of Worldwide Research Production in Emergency Medicine

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[1]Harvard Medical School, Boston, MA; [2]Massachusetts General Hospital / Harvard Medical School, Boston, MA

Background: Few studies have been conducted over the last decade to assess the state of global research productivity in the field of EM. Although previous studies have shown the United States as the main contributor to EM-related research, the contemporary spread of EM over the 21st century has affected the global landscape of EM research production.

Objectives: As an attempt to depict the global spread of EM over the last 15 years, we aimed to determine the contribution of different world regions to global EM research productivity from 2000 - 2014.

Methods: Using the PubMed database, we retrieved information regarding the origin of journal articles included in the "Emergency Medicine" category of the Journal Citation Reports database over a 15-year period (2000 - 2014). Employing a previously tested bibliometric methodology, we divided the world into 9 regions based on geographic, scientific, and economic criteria: U.S., Canada, Western Europe, Eastern Europe, Latin America (including Mexico, South and Central America), Asia (excluding Japan), Japan, Africa, and Oceania. We assessed global research productivity by determining the total number of published articles and their mean impact factor for each year of the study period for all 9 world regions. We also conducted further analyses to normalize by population and gross national income per capita (GNIPC).

Results: Of 49,407 EM journal articles retrieved from 23 journals, 49.7% originated from the United States, while 25.7% originated from Western Europe. The rate of increase of total published research product (the impact factor multiplied by total number of articles) over the study period was highest in Eastern Europe and Asia (19.5 and 10.4-fold increase, respectively). The United States had the best performance for all years when adjusted for population and GNIPC. Although the total EM research contribution from the other regions was notably low, all global regions experienced an increased rate of research production during the study period.

Conclusion: EM research productivity has increased worldwide in all regions from 2000 - 2014. While the United States still remains the largest contributor to the field, all other global regions experienced a larger increase in the rate of total published research product over the study period, providing evidence for the global spread of EM during the 21st century.

427 What Do We Know About Pediatric Palliative Care Patients Who Consult the Emergency Department?

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Background: Little is known about pediatric palliative care (PPC) patients' visits to the emergency department (ED).

Objectives: To determine the characteristics of PPC patients' ED visits.

Methods: Five-year retrospective chart review in a tertiary care pediatric university-affiliated hospital. Patients were eligible if initial consultation with the PPC team occurred between April 1st 2007 and March 31st 2012. For each eligible patient, ED visits between these dates were included. Data was drawn from the ED's electronic data system and the patient's medical chart.

Results: During the study period, 290 new patients were followed by PPC; of these, 93 patients (32.1%) consulted the ED, for a total of 218 visits. Median number of visits per patient was 2 (range: 1-8). Patient median age was 7 years 5 months (range: 1 month-22 years) and most common baseline diagnoses were: oncological diagnosis (39.8%), encephalopathy (28.0%) or genetic/chromosomal anomaly (12.9%). No patients died in the ED, but 35 (37.6%) died during the episode of care following one of their ED visits and 17 (18.3%) of them died within 72h of admission. Table 1 shows PPC patients' ED visits' characteristics.

Table 1. ED visit characteristics	N = 218
Triage acuity	
- CTAS* 1	25 (11.5%)
- CTAS 2	86 (39.4%)
- CTAS 3	85 (40.0%)
- CTAS 4	18 (8.3%)
- CTAS 5	4 (1.8%)
Arrival time	
- Day (8h-16h)	99 (45.4%)
- Evening (16h-24h)	89 (40.8%)
- Night (00h-8h)	30 (13.8%)
Ambulance arrival	83 (38.1%)
Admission to resuscitation room	53 (24.3%)
Medical consultation	77 (35.8%)
Reason for consultation	
- Respiratory distress/dyspnea	67 (30.7%)
- Pain	28 (12.8%)
- Seizure	25 (11.5%)
- Fever	20 (9.2%)
- GI symptoms	17 (7.8%)
- Fatigue	16 (7.3%)
- Catheter technical issues	13 (6%)
Advanced care directives signed at time of ED visit	143 (65.6%)
Discussion about goals of care reported in medical chart	82 (37.6%)
Patient disposition	
- Discharged	45 (20.6%)
- Admitted to ward	133 (61.0%)
- Admitted to PICU	16 (7.3%)
Any ED work-up	172 (78.9%)
Median length of stay (range)	3h 50min (13min – 15h 10min)

*Canadian Triage and Acuity Scale

Table 427: Gaucher.

Conclusion: Most PPC patients presented to the ED acutely ill, requiring work-up and admission. One-third presented in their end of life. Understanding the characteristics of PPC patients' ED visits is the first step in offering better care for these complex patients.

428 Outcomes Associated with Indeterminate and Negative Appendiceal Ultrasounds

Jeremiah Duane Smith, Andrea Goode, Michael Runyon, and Stacy Reynolds
Carolinas Medical Center, Charlotte, NC

Background: Ultrasound may diagnosis appendicitis without ionizing radiation but the studies frequently have indeterminate results.

Objectives: To characterize the diagnostic output of ultrasound evaluation and the associated clinical outcomes among children 3-18 years old with possible appendicitis.

Methods: This was a planned secondary analysis of a database of children with possible appendicitis enrolled from 3 community EDs and 1 tertiary care, urban children's hospital. Patients were included if they had laboratory or imaging tests performed for appendicitis. Patients were excluded if imaging occurred at an outside hospital or was performed for an indication other than appendicitis. Each ultrasound was reviewed and categorized as positive, negative (direct visualization of the appendicitis), or indeterminate. The criterion standard for appendicitis was defined by pathology reports. Trained physician researchers used a standardized case report form and explicitly defined variables to abstract study data. The study team met regularly to resolve disputes and ensure consistency.

Results: We enrolled 3586 children who presented in 2012 with undifferentiated abdominal pain and 662 (18%) had an ultrasound to evaluate for appendicitis. Of these, 85 (13%) were interpreted as positive for appendicitis, 153 (23%) were negative, and 424 (64%) were indeterminate. Among patients with indeterminate ultrasound studies, 90 (21%; 95%CI 17%-25%) required a CT scan, 218 (51%; 95%CI 47%-56%) required inpatient observation, 45 (11%; 95%CI 8%-14%) returned to the ED with continued complaints, and 39 (9%; 95%CI 7%-12%) ultimately required appendectomy. 244 (58%; 95%CI 53%-62%) of indeterminate ultrasounds occurred between 5pm and 8am.

Conclusion: Ultrasound for appendicitis yields a high rate of indeterminate studies. Approximately half of these patients are admitted to the hospital, 21% undergo CT imaging, and 9% ultimately require appendectomy. There was no significant increase, beyond expected, in the number of indeterminate scans obtained between the hours of 5pm and 8am.

429 Improving Communication in ED to ED Interfacility Transfers

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Background: Transfer of care has been identified as a high risk period for communication failures leading to patient safety errors. At our institution, interfacility transfers rely on a form that is filled out by a nurse who communicates with the transferring provider. While limited research exists on best practices for emergency department (ED) handoff, the SBAR (situation, background, assessment, recommendation) framework has been widely adopted in healthcare communication.

Objectives: To evaluate the effect of SBAR format on the completion of transferring provider recommendations for patient care.

Methods: We conducted an observational study of the effect of adding SBAR format to written transfer communication. Initially, we calculated that 107 patients were required to detect a 20% difference in completion rate. Patients were selected using a random number generator from all transfers in March, 2014 (pre-intervention) and March, 2015 (post-intervention). Forms were blinded and given to two attending reviewers who had agreed on standardized definitions and underwent calibration prior to the study. 24 forms were given to both reviewers to calculate interrater reliability. Lastly, a survey was created to assess provider perception of the forms before and after SBAR implementation. Chi square testing was used for analysis of form completion and non-parametric tests (Fisher's exact) for the survey analysis.

Results: A total of 266 forms were reviewed (134 before and 132 after SBAR implementation). Agreement between reviewers was excellent (kappa=0.83). A recommendation was stated in 44.6% of the forms in the pre-intervention group and 50.8% after (p=0.34). Providers were surveyed pre- and post-intervention as to whether the following specific elements were present in transfer forms: a clearly stated reason

for transfer, pertinent exam findings, clinical impression, and specific recommendations. The answer to all survey questions significantly improved in a positive direction ($p<0.01$ for each element).

Conclusion: Implementation of SBAR format did not result in a statistically significant increase in the degree of completion of written handoff, though it did result in an increased perception by providers of form completion. Further study and process improvement will be needed to optimize interfacility transfer communication.

430 Skills and Knowledge Assessment of Indian Emergency Medical Technicians (EMTs)

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Background: The Sustainable Development Goals (SDGs) have highlighted the importance of access to emergency care in developing nations. Prehospital providers are often an under recognized cadre of healthcare providers in developing countries. Prior studies have not assessed the capacity of practicing emergency medical technicians (EMTs) in LMICs to retain critical, life-saving knowledge and skills following their inaugural prehospital care training programs.

Objectives: Assess practicing EMTs' retention of essential clinical knowledge and vital procedural skills in three Indian states.

Methods: All study participants were practicing EMTs who had previously completed a six-week EMT-basic training course. Clinical knowledge was assessed through a 60-question multiple-choice exam (MCQ) testing fifteen subject areas; the exam was validated prior to the study with American EMTs and Indian EMT instructors. Clinical acumen was assessed through an objective structured clinical examination (OSCE) of nineteen vital skills at five stations. Examiners scored participants performing each OSCE (pass/fail) by utilizing a standardized checklist created by experienced emergency physicians. Chi-square testing, ANOVA, and multivariable regression analysis were used to predict MCQ scores with baseline demographics. Cohen's Kappa was used to evaluate inter-rater reliability.

Results: 255 practicing EMTs were assessed in Karnataka (n=87), Tamil Nadu (n=102), and Gujarat (n=65). Eighty-one percent were male, median age was 27 years (IQR: 25-28), and median length of experience was 39 months (range 3-63). The median MCQ score was 46.7% (IQR: 41.7-51.7). Study site and confidence in English language proficiency modestly predicted MCQ score (adjusted R^2=0.06, F (4,249)=5.32, $p<0.001$). For the OSCE stations, the percent passed were: obstetrics (9.55%), chest trauma (2.47%), spinal immobilization (1.60%) and airway management/CPR (0.40%).

Conclusion: This novel assessment of practicing Indian EMTs identified critical gaps in knowledge and skill retention highlighting the need for structured continuing education.

431 Heart Rate Volatility Predicts ED disposition location

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Background: The growing number of hospital admissions in the last two decades resulted in the need to better utilize hospital resources such as Intensive Care Unit (ICU) admissions. Heart Rate Volatility (HRVO) is new and promising physiological measure of sympathetic activity defined by the standard deviation (SD) of the heart rate (HR) over fixed time intervals. HRVO has been shown to be an early non-invasive predictor of mortality for trauma patients in the intensive care setting and also reduced HRVO was found to be associated with mortality within 48 hours after surgery. We hypothesized that patients who were admitted to ICU will experience reduced HRVO during ED stay.

Objectives: We sought to investigate the relationship between reduced HRVO (defined as SD <0.5 bpm within a given time interval) during ED stay and disposition location.

Methods: HR data was sampled and collected every 5 seconds from patients who were admitted to the resuscitation beds in our ED over the last year. HRVO was computed continuously every 5 minutes and then stored in an outcome-linked database. Disposition locations (the outcome) were collapsed into five categories: Patient Died, ICU/Step Down, Regular floor, Observation and Home. Logistic regression model adjusting for age, gender, history of Congestive Heart Failure, Diabetes, Hypertension, Asthma and Sleep Apnea was used.

Results: Approximately 7,000,000 HR data points were collected and archived from 2,051 patients, resulting in 115,646 five-minute intervals that were analyzed. The disposition location breakdown was as follow: Patients Died: 9, ICU/Step Down: 662, Regular Floor: 723, Observation: 306 and Home: 351. The normalized median time spent with low HRVO is presented in figure 1. The odds of admitting a patient to ICU from the resuscitation area given reduced HRVO during their ED stay are 2.15 times the odds given normal volatility (95%CI 1.71-2.71).

Conclusion: We found that reduced HRVO identified patients more likely to be admitted to ICU. Early detection of autonomic dysfunction is crucial for acutely ill patients and can lead to better outcomes.

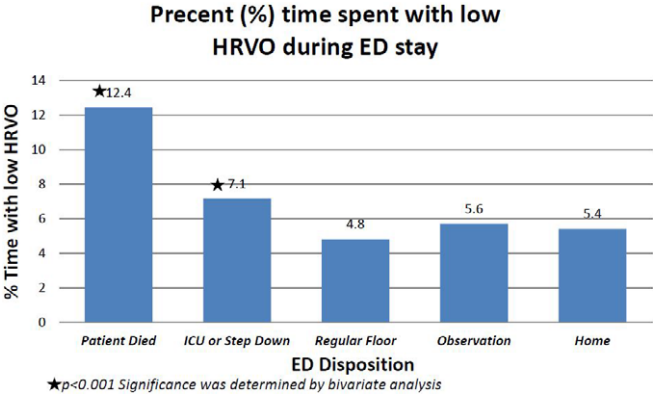

Figure 431 – Mandel-Portnoy

432 Transesophageal Echocardiography in Simulated Cardiac Arrest Performed By Emergency Medicine Physicians

Don Byars[1], Turan Kayagil[1], Matt Jones[1], Anja Cipi[1], David Evans[2], Michael Vitto[2], Jordan Tozer[2], and Michael Joyce[2]
[1]*Eastern Virginia Medical School, Norfolk, VA;* [2]*Virginia Commonwealth University, Richmond, VA*

Background: Transesophageal echocardiography (TEE) is an established accurate method of evaluating heart anatomy and function. It has many advantages over transthoracic echo in the setting of cardiac arrest. Prior studies have not examined the ability of emergency medicine (EM) physicians to acquire and retain TEE skills, nor have they demonstrated the ability for EM physicians to rapidly identify pathologies commonly seen during cardiac arrest.

Objectives: To evaluate the ability of EM physicians to learn and apply TEE image acquisition techniques to identify pathological causes of cardiac arrest.

Methods: This was a prospective educational cohort study with 40 EM physicians from two medical centers. All participants underwent educational sessions and were tested via OSCE across six cases ranging from two normal cases to four pathologic cases. Primary measured end points were correct identification of the cardiac pathology, if any, and time to diagnosis. Calculated end points include sensitivity, specificity,

PPV and NPV for EM performed TEE across the range of cases. A kappa statistic was calculated to determine the degree of inter-rater reliability.

Results: 40 EM physicians completed the protocol. This resulted in a total of 80 normal TEE studies and 160 pathologic TEE studies. Our calculations for the ability to diagnose life threatening cardiac pathology by EM physicians in a high fidelity TEE simulation resulted in a sensitivity of 98.5%, a specificity of 99%, a PPV of 99.5%, and a NPV of 97.1%. The average time to diagnose each OSCE case was a follows: Normal A in 35 sec, Normal B in 31 sec, Asystole in 13 sec, Tamponade in 14 sec, Acute MI in 22 sec, and V-FIB in 12 sec. Inter-rater reliability was extremely high resulting in a Kappa Coefficient across all cases of 0.95, where >0.9 is considered to be "almost perfect".

Conclusion: EM physicians can rapidly perform TEE studies in a simulated cardiac arrest environment with high degrees of precision and accuracy.

433 A Descriptive Analysis of Ventricular Assist Device Patients Presenting to an Urban Academic Emergency Department

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Background: The number of advanced heart failure patients treated with a left ventricular assist device (LVAD) is increasing with over 10,000 device implantations to date. Despite this growing population, little is known about how these patients present to the emergency department.

Objectives: To characterize the ED presentation of LVAD patients in search of themes in epidemiology, evaluation and management that may highlight successful practices as well as areas for improvement in caring for this patient population.

Methods: A retrospective chart review was completed for for all (143) institutional LVAD patients presenting to the ED over a 5-year period between July 1, 2009 and June 30, 2014. Two abstractors reviewed all ED encounters for chief complaint, ED and hospital course, diagnosis, and disposition.

Results: A total of 620 ED encounters were identified. Of these, 431 (70%) resulted in admission, 187 (30%) resulted in discharge, 1 left against medical advice, and 1 left without being seen. Among all encounters 182 (29%) presented with bleeding problems (e.g. gastrointestinal bleeding, epistaxis), 127 (20%) had infections (e.g. bacteremia, driveline infection), 68 (11%) had heart failure exacerbations, and 36 (6%) had an arrhythmia or implantable cardioverter-defibrillator (ICD) fire (see Shappell Figure 1). Only 52 encounters (8%) ultimately had LVAD-specific issues. Of these, presenting symptoms were abnormal LVAD readings/alarms in 36 patients, grossly damaged LVAD equipment in 2 patients, and nonspecific complaints in 13 patients. All 13 patients with nonspecific complaints and 10 patients with abnormal device readings were diagnosed with pump thrombosis. LVAD-specific treatments included hardware exchange in 10 patients and adjustment of device settings in 3 patients. No patients required CPR and no patients died in the ED.

Conclusion: Greater than 90% of LVAD patient presentations to the ED were unrelated to device function and were managed using traditional techniques. Care for LVAD-specific complications requires familiarity with interpreting LVAD readings and recognition of LVAD thrombosis.

Shappell Figure 1: LVAD ED Encounters by Category

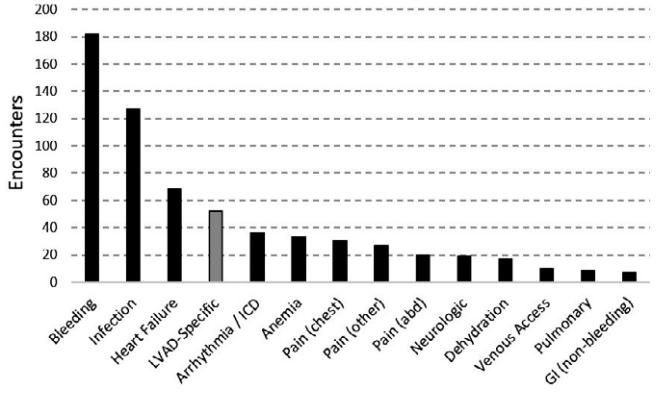

Figure 433 – Shappell

434 Delta Plasmin: A New Fibrinolytic for Treatment of Submassive and Massive Pulmonary Embolism

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[1]Indiana University School of Medicine, Indianapolis, IN; [2]Louisiana State University-New Orleans, New Orleans, LA

Background: Treatment for submassive/massive pulmonary embolism (PE) can be treated with thrombolytics. Thrombolytics activate plasminogen into the active form, plasmin, but thrombolytics have a circulating half-life of 2-3 minutes. Delta-plasmin (D-plasmin) is a recombinant plasmin derivative with an extremely short half-life of 0.25 microseconds.

Objectives: Compare the effect of tissue plasminogen activator (tPA) vs delta-plasmin, a direct plasmin derivative, in a validated animal model of submassive/massive PE.

Methods: Domestic swine (~50 kg) were anesthetized with α-chloralose. Autologous clots were delivered via external jugular vein to produce systolic pulmonary arterial pressures (PAP)> 55 mmHg, decrease $etCO_2$ or systemic hypotension. Clot delivery was confirmed via ultrasonography. Enoxaparin (1 mg/kg) was given in conjunction with either tPA (100 mg) or D-plasmin (100 mg). Animals were monitored via Swan-Ganz and arterial catheters, $etCO_2$, and SpO_2. Troponin I and cardiac ultrasound were recorded for measurements of right ventricle (RV) strain throughout the procedure. Animals were euthanized at the conclusion (~9 hrs). Comparisons were made using T-tests with a Bonferroni correction.

Results: A total of 8 animals (tPA=6, D-plasmin=2) were completed. All animals showed signs of RV strain after clot delivery with systolic PAP > 55 mmHg, and increased RV/LV ratios (Avg 1.17±0.25). D-plasmin animals showed a relative increased in $etCO_2$ (3%±5%) after treatment versus tPA (-1%±4%). Additionally, D-plasmin had a lower RV/LV ratio (0.75±0.1) compared with tPA (0.91±0.04). D-plasmin demonstrated a higher heart rate (105±7 vs 91±21), and higher systolic PAP when compared to tPA (52±4 vs 45±7). All differences represent a P value <0.01. No difference was seen between cardiac output, arterial blood pressures or troponin.

Conclusion: In our large animal model of submassive/massive PE, D-plasmin shows promise as a new pharmacologic agent for fibrinolysis in pulmonary embolism. Future studies need to be directed at bleeding, hyperfibrinolysis and longer term studies.

435 Evidence of Right Ventricular Dysfunction Improves the Accuracy Of Pulmonary Embolism Severity Index to Predict In-Hospital Adverse Events in Patients with Acute Pulmonary Embolism

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Background: Risk assessment for patients with acute pulmonary embolism (PE) is evolving. Prediction of adverse inpatient events helps to guide disposition to the proper level of care. The Pulmonary Embolism Severity Index (PESI) has been validated for risk of adverse outcomes at 30 days, but there is less data for in-hospital risk stratification.

Objectives: Our hypothesis was that using both PESI and evidence of RVD (CT signs of RV dilation, EKG, cardiac markers) can identify patients at risk for adverse inpatient events.

Methods: Patients presenting to an urban emergency department admitted with an acute PE between 2010 and 2015 were reviewed. PESI was categorized I-V. Evidence of RVD included findings on CT, EKG, or cardiac biomarkers. The main outcome was a composite of adverse outcomes: death, cardiac or respiratory instability, invasive intervention, bleeding. Pearson's Chi Squared test, binomial logistic egression analysis, and ROC curves were performed.

Results: 266 patients with acute PE were analyzed (to detect a difference of AUC>.1), with 30 (11.3%) having 1 or more adverse outcomes. PESI Class predicted adverse outcomes (OR 1.55, CI 1.17-2.06). Categorically, PESI III-V was most predictive (sens .73, spec .55, AUC .640 p=.013). Adding CT evidence of RVD or multilobar PE improved the sensitivity and specificity (.70 and .70, respectively, AUC .697, p<.001). In pts with EKG's (n=227), PESI III-V+CT+EKG findings further improved the sensitivity (sens .81, spec .67, AUC .720 p<.001). In patients with EKG findings and troponins (n=136), addition of troponin did not improve accuracy.

Conclusion: PESI classification plus evidence of RVD on CT and/or EKG, increased the ability to detect in-hospital adverse outcomes in patients with PE. This provides an objective means to identify high risk patients in the emergency department that can aid in appropriate disposition of patients and identify patients appropriate for specialty consultation.

436 Validation of Travel Distance as an Instrumental Variable for Evaluating the Effectiveness of Regionalized Trauma Care

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Background: Studies comparing outcomes of treatment at specialty hospitals vs. non-specialty hospitals have used the differential distance from the patient's location to each hospital as an "instrumental variable" to adjust for the selection bias of sicker patients being treated at specialty hospitals. However, the empirical validity of this approach has not been well demonstrated for emergent conditions, given that distance must be strongly associated with likelihood of transport to a specialty hospital among those who explicitly meet triage criteria but not be correlated with prognosis.

Objectives: Test hypothesis that: 1) increased differential distance from the scene of injury to a trauma center vs. a non-trauma center is associated with decreased likelihood of trauma center transport among patients who explicitly meet physiologic trauma center transport criteria; and 2) differential distance to a trauma center is not associated with physiologic instability.

Methods: We analyzed all 2009-10 adult EMS trauma transports (N=70,879) in the New Jersey EMS Data Warehouse. For each patient, we calculated the difference in straight-line distance from the injury scene ZIP code centroid to the address of the closest Level I/II trauma center minus the distance to the closest non-trauma center and determined whether they met physiologic triage criteria defined as either: a sBP <90, GCS<14, RR<10 or >29, or prehospital intubation. We tested for differences in the proportion who met physiologic triage criteria and the proportion of those who were transported to a trauma center across quintiles of the differential distance from a trauma center vs. non-trauma center using logistic regression.

Results: The trauma center transport rate was strongly correlated with distance to a trauma center as 86% of unstable patients who lived closest were transported vs. 39% of those who lived farthest away (Table 1, P<0.01). Less than 50% of unstable patients were transported if the distance to a trauma center was 3 more miles than to a non-trauma center. However, distance to a trauma center was not associated with the likelihood of physiologic instability.

Conclusion: Differential travel distance meets the empiric assumptions of a valid instrumental variable for comparative effectiveness studies of regionalized trauma care. There is much room to improve trauma center triage and regionalization.

Quintile of additional distance to a trauma center vs. a non-trauma center (miles)	Proportion of transports who meet trauma center physiologic criteria, row %	Proportion of those who meet triage criteria actually transported to a trauma center, row %
-8.7 to 0.5	12.0	85.7
0.6 to 2.9	13.7	58.8
3.0 to 6.5	13.4	43.8
6.6 to 11.0	12.4	35.1
11.1 to 35.3	13.3	39.0

Table 436: Kit Delgado.

437 Psychological Effect of Witnessed Resuscitation on Family Members in the Emergency Department

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Background: Family members are profoundly impacted when a loved one suffers a devastating critical illness and is taken to the emergency department (ED). Studies have shown that family members, given the opportunity, would choose to be present during the resuscitation of a loved one. Family Witnessed Resuscitation (FWR) is a fairly new and emerging concept. Little is known about the psychological impact this may have on family members.

Objectives: To determine the psychological impact of FWR on family members of patients requiring resuscitation in the ED.

Methods: In our study, we generated a list of patients who underwent resuscitation and identified family members who were present in the ED during the resuscitation via our ED electronic medical record. Family members were called one month post-event and administered the Impact of Event Scale-Revised (IES-R), a 22-item validated scale that measures post-traumatic distress symptoms and correlates closely with DSM-IV criteria for post-traumatic stress disorder (PTSD). The total IES-R score range is 0 to 88, with scores >24 associated with clinical concern for PTSD or partial PTSD, >33 with probable PTSD, and >37 with PTSD severe enough to suppress immune system function. Family members were placed into two groups based on whether they stated they had witnessed the resuscitation (FWR group) or not witnessed the resuscitation (FNWR group). Data analyses included chi-square test, independent sample t-test, and linear regression controlling for gender and age.

Results: To date, a convenience sample of 325 family members have responded to the phone interview: 200 FWR and 125 FNWR. Family members consisted primarily of children, parents, and spouses. There were no statistically significant differences in age (P=.747) and gender (P=.057) between the groups. The FWR group had significantly higher mean total IES-R scores: 29 vs. 24 (P<.05) which were consistent after controlling for age and gender.

Conclusion: Preliminary results indicate that family members who witness ED resuscitations may be at increased risk of PTSD.

438 Mitochondrial and Nuclear DNA Levels in Post-Cardiac Arrest Patients

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Background: Ischemia during, and repercussion after cardiac arrest triggers a series of systemic and organ-specific responses. Preclinical studies have shown that cell death may involve alterations in mitochondrial function.
Objectives: We aimed to establish whether there are detectable plasma levels of mitochondrial DNA markers in post-arrest patients. To differentiate mitochondrial injury from cellular injury we further collected nuclear DNA markers. We then evaluated whether these markers were associated with outcomes.
Methods: In this multi-center study, patients with an out-of-hospital cardiac arrest, who were comatose following return of spontaneous circulation (ROSC) were enrolled at four tertiary care centers in the US. Following ROSC, blood draws were performed as soon as possible. Control patients without chronic or acute illness were also enrolled. We measured cell free DNA, two markers of nuclear DNA (single-copy beta-2-Microglobulin [B2M] and RNAase P) and two markers of mitochondrial DNA (mtDNA-tRNAleu and mtDNA-D loop). We compared groups using the Wilcoxon Rank-Sum test. We used Spearman's correlation coefficient (r_s) to assess correlations.
Results: 101 post-cardiac arrest patients and 46 controls had nuclear and mitochondrial DNA measured. Post arrest patients had higher RNAase P (3.4 [1.3, 5.7] vs. 1.2 [0.8, 1.2], $p < 0.001$) and B2M (12.0 [1.0, 22.9], vs. 0.6 [0.6, 1.3], $p < 0.001$) than controls. There was no difference in mtDNA-tRNAleu levels (1.0 [0.7, 1.4] vs. 0.8 [0.5, 1.3], $p = 0.10$). mtDNA-D-loop values were lower in arrest patients (0.7 [0.4, 1.1] vs. 1.4 [0.6, 2.4], $p = 0.001$, figure 1a). There was no difference in any of the nuclear or mitochondrial DNA markers between survivors and non-survivors (all $p > 0.05$, figure 1b). Cell free DNA was higher in arrest patients as compared to controls (420 [227, 676] vs. 212 [162, 275], $p < 0.001$). There was no difference between arrest non-survivors and survivors ($p > 0.05$). Lactate was weakly correlated to RNAase P ($r_s = 0.22$, $p = 0.04$), B2M ($r_s = 0.31$, $p = 0.002$), and mtDNA-D-loop ($r_s = 0.28$, $p = 0.006$), but not with mtDNA-tRNAleu or cell free DNA.
Conclusion: Markers of nuclear DNA and cell free DNA were elevated in cardiac arrest patients compared to controls, although there was no difference between survivors and non survivors. We found no elevation of mitochondrial DNA in cardiac arrest patients.

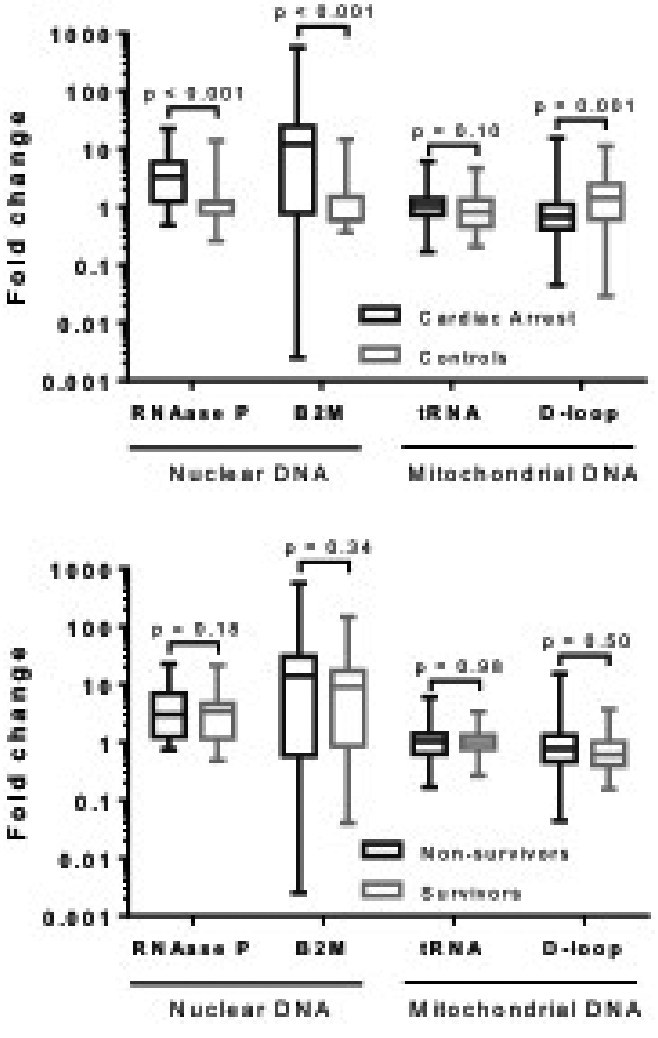

Figure 438 – Karlsson

439 Shifting with Insulin, Albuterol, or Sodium Bicarbonate in Severe Hyperkalemia in the ED is Not Associated with a Repeat Dialysis Run Within 24 Hours

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Background: Hyperkalemia is a common and potentially life threatening condition that can be rapidly fatal if left untreated. Insulin, albuterol, and sodium bicarbonate are often administered to shift potassium to the intracellular space. Some nephrologists recommend avoiding the use of shifting medications when possible, with the thought that the first emergent dialysis run will not remove a sufficient amount of potassium from the extracellular space, necessitating a repeat dialysis run within 24 hours.
Objectives: To determine if the use of shifting medications for severe hyperkalemia is associated with a need for repeat dialysis runs within 24 hours.
Methods: This is a retrospective observational cohort study at a high-volume urban Level I trauma center of any ED patient 18 years or older found to have a potassium level > 5.3 mEq/L from January 2010 to June 2015; values of elevated potassium from hemolyzed specimens were excluded. All data was pulled directly from the electronic medical record. Demographic data, laboratory values, treatments administered, and the timing of hospital dialysis runs were collected. Insulin, albuterol, and sodium bicarbonate were considered to be shifting medications. Multivariable logistic regression, including all patients who had at least one dialysis run in the hospital, was performed with a priori selection of the independent variables that were deemed to be plausibly related to the dependent variable of repeat dialysis run within 24 hours. The primary predictor was whether shifting medications were administered. Co-variates were age, initial potassium value, and whether the patient was on chronic dialysis.
Results: 1,974 patients with hyperkalemia were identified, of whom 512 (26%) had dialysis during the hospital stay. Of patients who had dialysis, 203 (40%) received a shifting medication in the ED. Logistic regression showed that receiving a shifting medication in the ED was

Table 1: Logistic regression for second dialysis run within 24 hours

	Odds Ratio	95% Confidence Interval
Received a shift medication in the ED	0.76	0.49 to 1.18
Age	1.00	0.99 to 1.01
Initial Potassium Value	1.43	1.10 to 1.85
Presence of ESRD	0.53	0.33 to 0.85

Table 439: Driver.

not associated with a repeat dialysis run within 24 hours. Patients with a higher first potassium value were more likely to have a repeat dialysis run; those on chronic dialysis were less likely to have a repeat dialysis run. See Table.

Conclusion: In this single-center, retrospective study, receiving a shifting medication was not associated with a need for repeat dialysis within 24 hours of the first dialysis run.

440 Reduction of Early VAP After Institution of VAP Prevention for Patients Intubated in the Emergency Department

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Background: Ventilator-Associated Pneumonia (VAP) leads to high morbidity and mortality in ventilated patients. Eckert (2006) and Carr (2007) have linked VAP in trauma patients to Emergency Department (ED) intubation and ED length of stay (LoS). As early-onset VAP is linked to oropharyngeal colonization, we hypothesize that early VAP rates may be reduced by an ED-based VAP prevention program.

Objectives: To determine whether an ED-based VAP prevention program reduces VAP rates.

Methods: A pre/post design was used with a historical control. PRE patients were retrospectively identified using an existing airway database. Staff was trained in VAP prevention and the VAP bundle was deployed in the ED. POST patients were prospectively identified. Kaplan-Meier curves were constructed showing time till acquisition of VAP. Log rank test for equality was performed, and Cox regression using the Breslow method for ties was used for proportional hazards analysis.

Results: The PRE and POST groups comprised 192 and 153 patients, respectively, with VAP rates of 11 (5.7%) and 6 (3.9%). Log Rank test showed a significant difference in VAP (X^2 = 4.19, p = 0.0407). Cox regression identified a Hazard Ratio of 1.38 for baseline Clinical Pulmonary Infection Score (CPIS) (p = 0.001) and a Hazard Ratio of 0.19 for the VAP prevention bundle (p = 0.006). Kaplan-Meier curves demonstrate both a reduction in overall VAP rates and a reduction in early-onset VAP.

Conclusion: An ED-based VAP prevention bundle is associated with lower overall and early VAP rates in patients intubated in the ED.

441 Characteristics of Patients with Subdural Hematoma

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Background: Subdural hematoma (SDH) is the most common lesion seen in patients with intracranial hemorrhage after traumatic injury. These patients have varied mechanisms and severity of injury, making a uniform treatment strategy challenging.

Objectives: We evaluated patients with subdural hematoma (SDH) to characterize demographic traits, clinical characteristics, patient outcomes and ICU utilization.

Methods: We performed a retrospective review of a cohort of consecutive patients age ≥ 16 with Glasgow Coma Scale ≥ 13 and CT documented SDH who presented to an urban, tertiary Level I Trauma Center with 100,000 annual ED visits from 2009-2013. Primary outcomes evaluated were the need for neurosurgical intervention, worsening findings on repeat CT scan or neurologic deterioration.

Results: We reviewed a total of 634 patients with SDH. The mean age was 62.1 years and 59.8% of patients were male. Falls were the most common mechanism of injury (461 patients, 72.7%), followed by assault (59, 9.3%) and MVC (30, 4.7%) (p<0.0001). 38.9% of patients were on antiplatelet medications and 12.3% on warfarin. 23% were admitted to the ICU, 47.8% to the floor and 17.4% to the ED observation unit. Overall, 8.8% required neurosurgical intervention, 10.5% had worsening findings on repeat CT and 6.6% had neurologic deterioration. 66% of SDH had convexity components (cSDH), while 33.7% were tentorial or interhemispheric SDH (tihSDH). When compared to cSDH, tihSDH patients were more likely to have a GCS 15 (88% vs.76%, p <0.0001) and less likely to need ICU level of care (14.7% vs. 27.6%, p=0.0003), to have CT worsening (6.2% vs. 12.8%) or to require neurosurgical intervention (1.9% vs. 12.9%, p<0.0001). There was a trend toward increased neurologic deterioration in cSDH compared to tihSDH (7.8% vs. 4.3%, p=0.09).

Conclusion: Fall is the most common mechanism of injury resulting in SDH. A sizable portion of patients with SDH require admission to an ICU or neurosurgical intervention. However, patients with tihSDH appear to be lower risk and are good candidates for further study regarding less intensive resource utilization.

442 An Emergency Department-Based Intensive Care Unit Decreases Hospital and ICU Utilization in Diabetic Ketoacidosis

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Background: Patients in diabetic ketoacidosis (DKA) commonly have severe metabolic derangements requiring resource intensive management. Most are admitted to the hospital at substantial cost, and many to an intensive care unit (ICU), although this level of resource utilization may not be necessary or improve outcomes. The Emergency Critical Care Center (EC3) is a nine bed ICU contained within the adult ED at the University of Michigan with the goal of delivering high quality critical care in the ED for the first 24 hours of critical illness. We hypothesized that early aggressive management of DKA in EC3 would result in fewer hospital and ICU admissions.

Objectives: To evaluate the impact of an ED-based ICU on disposition outcomes for adult ED patients in DKA.

Methods: An electronic medical record search identified adult ED patients diagnosed with DKA from 2014-2015. The authors manually reviewed patient charts to confirm the diagnosis and excluded patients with initial pH >7.3 or bicarbonate >18 mEq/L. Consecutive DKA patients managed in EC3 since opening February 16 to September 28, 2015 were compared to a similar number of consecutive DKA patients managed immediately prior to EC3 opening. Baseline demographic and clinical data and disposition were evaluated.

Results: A total of 148 cases of DKA were used for analysis, 74 before and 74 after EC3 opening. Baseline demographics and clinical variables were similar between groups. Compared to the control group, we observed a significant decrease in the number of hospital admissions from 69 to 55 (relative risk reduction 0.8 [95%CI 0.69-0.92, p<0.05]). This resulted in an ARR of 19% (95%CI 7-31%) and NNT of 5 (95%CI 3-14). A trend was noted in reducing the ICU admission rate from 15 to 8 with a RRR of 0.53 (95%CI 0.24-1.18), though this did not reach statistical significance.

Conclusion: The care of adult DKA patients within an ED-based intensive care unit was associated with a significantly decreased rate of hospital admission and a trend towards decreased ICU utilization.

443 Is it Time to Standardize the ED Acute Coronary Syndrome Work Up?

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Background: Clinical pathways for the ED diagnosis of acute coronary syndrome (ACS) are highly variable across facilities.

Objectives: To characterize the use of ECG, serum troponin assays, and NIVT to diagnose STEMI, NSTEMI and unstable angina (UA) in EDs.

Methods: Retrospective cross-sectional cohort study of EDs. Data was obtained from the annual review of clinical operations and myocardial ischemia clinical practice metrics of The ED Operations Study Group, a clinical operations research consortium. The sample includes 62 diverse EDs including sites with 2,456 to 118,613 annual patient visits, academic and community practices, as well as rural and urban locations. There was an 89% survey completion rate.

Results: 82.5% of EDs have a screening protocol for an early ECG to diagnose STEMI, of which 16.9% use chest pain as the sole criteria. 11.5% leave STEMI screening to triage staff discretion. Only 33.3% routinely risk stratify patient for acute myocardial ischemia before troponin testing, and just 34.5% use a common definition for low risk ACS patients. Median interval used to detect a rise in serum troponin in potential NSTEMI patients is 240 minutes with a wide IQR of 150 to 255 despite 81.3% using sensitive/high sensitive assays. 42.4% use Exercise treadmill testing as the first line NIVT to detect obstructive CAD as a sign that presenting symptoms were caused by UA. However, the majority use more expensive tests: 33.9% nuclear imaging, 17% stress echo, 3.4% coronary CTA, and 1.7% cardiac MR. 40.1% have clinical guidelines for the use of NIVT for ED patients but the majority do not. Only 18.6% have clinical guideline for emergency cath (within 2 hours) of high risk NSTEMI patient.

Conclusion: There is variable use of ECG, serum troponin, and NIVT to diagnose STEMI, NSTEMI and UA, respectively, across EDs. This suggests varied integration of the literature into clinical practice and variable use of high and low cost resource options for a similar clinical population. A better understanding of facility and patient population characteristics driving resource use will assist in identifying best clinical practice and appropriate test utilization.

444 Return Precaution Understanding: A Potential Target for Reducing Bounce Backs

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Background: In light of ever increasing wait times, crowding and the associated cost burden, it is vital to address deficiencies within our emergency healthcare system that could decrease preventable bounce backs. Although many factors contribute to patient bounce backs, including worsening health, this study focused on three potentially key variables: language preference, follow-up understanding and understanding of return precaution instructions.

Objectives: To identify factors associated with increased bounce back rates that could be targeted in a subsequent intervention to decrease preventable bounce backs.

Methods: We surveyed a consecutive sample of patients at the time of discharge in the LAC+USC ED recording language preference, and asked questions to assess understanding of return precautions and follow-up instructions. For return precautions two independent research assistants categorized patients into five categories based on patients' recollection of their return precautions compared with written instructions in the medical record (see table below). Kappa concordance of the return precaution categorization was 0.974. For follow-up, one research assistant categorized patients into four groups: (1) correctly identifying follow-up, (2) incorrectly indicating no follow-up was given, (3) correctly identifying no follow-up and (4) incorrectly indicating they received instructions. Next, using the electronic medical record, patients who returned to LAC-USC ED within 30 days of discharge were identified.

Results: Language preference (English vs. Spanish) and understanding of follow-up appointments was not associated with higher bounce back rates. However, patients who incorrectly described their return precautions or were unable to recall their return precautions had a more than 50% relative increase in rate of bounce back. Full results in Table 1.

Conclusion: Our study shows that understanding of return precautions was correlated with bounce back rates while language preference and knowledge of follow-up were not. Interventions designed to reduce repeat visits should take this finding into account. Our results should be validated in populations of varying SES and language preferences.

Table 1
Burk

Return Precaution Understanding Category	Patient Did Not Bounce Back	Patient Did Bounce Back	Totals
Disease specific understanding	87 85.3%	15 14.7%	102
General understanding	183 85.5%	31 14.5%	214
Incorrect understanding unrelated to diagnosis	51 77.3%	15 22.7%	66
No specific return precautions were given	91 88.4%	12 11.7%	103
Unable to recall return precautions	15 75.0%	5 25.0%	20
Total	427	78	505

445 Reasons for Referral and Hospitalization Among Emergency Department Patients with Syncope

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Background: Syncope can be caused by serious life-threatening conditions not obvious during the initial ED assessment leading to wide variations in management.

Objectives: We aimed to identify the reasons for consultations and hospitalizations, outcomes among these patients, and the potential cost savings if an outpatient cardiac monitoring strategy were developed.

Methods: We conducted a prospective cohort study of adult syncope patients at 5 academic EDs over 41 months. We collected baseline characteristics, reasons for consultation and hospitalization, hospital length of stay and average total inpatient cost. Adjudicated 30-day serious adverse events (SAEs) included death, myocardial infarction, arrhythmia, structural heart disease, pulmonary embolism, significant hemorrhage and procedural intervention. We used descriptive statistics with 95% CI.

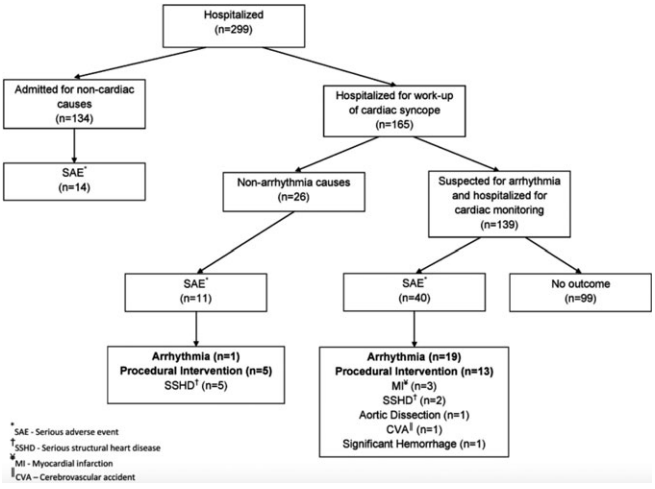

Figure 445 – Thiruganasambandamoorthy

Reasons for Referral or Hospitalization among ED Syncope with no SAE Identified in the ED

Reason	Referral in ED N=600 (%)	Hospitalized N=299 (%)	Mean Length of Hospital Stay – Days (SD)
Cardiac	333 (55.5)	165	6.7
Arrhythmia	106 (17.7)	44	6.5
Non-Arrhythmia	76 (12.7)	26	8.9
Both	151 (25.2)	95	6.3
Non-cardiac	267	134	10.5
Volume Loss	73	42	5.4
Intracranial Conditions	46	9	14.7
Infections	26	17	8.6
Intra-Abdominal Conditions	29	15	4.7

Table 445: Thiruganasambandamoorthy.

Results: Of the 4,064 patients enrolled (mean age 53.1 years, 55.9% female), 3,255 (80.1%) were discharged from the ED, 209 (5.2%) had a SAE identified in the ED, 600 (14.8%) with no SAE were referred for consultation in the ED and 299 (7.4%) were hospitalized: 55.5% of referrals and 55.2% of hospitalizations were for suspected cardiac syncope (46.5% admitted for cardiac monitoring of whom 71.2% had no cause identified). SAE among groups were 9.7% in total; 2.5% discharged by ED physician; 3.4% discharged by consultant from ED; 21.7% as inpatient and 4.8% following discharge from hospital. The mean hospital length of stay for cardiac syncope was 6.7 (95%CI 5.8, 7.7) days with total estimated costs of $7,925 per patient (95% CI: 7,434, 8,417).

Conclusion: Suspected cardiac syncope, particularly arrhythmia, was the major reason for ED referral and hospitalization. Majority of patients hospitalized for cardiac monitoring had no identified cause. An important number of patients suffered SAE, particularly arrhythmias outside the hospital. Development of a robust prediction tool and remote cardiac monitoring may improve patient safety and save substantial resources. Other causes were identified for 93 patients in the referral group and 51 patients in the hospitalized group

446 Association Between Electrocardiography and Tricuspid Annular Plane Systolic Excursion (TAPSE) in Assessing Pulmonary Embolism (PE) Severity

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Background: Daniels and TwiST ECG scores have been proposed to detect right heart strain (RHS). TAPSE, a dynamic measure of right ventricular (RV) systolic function, has been a reliable indicator of RHS, but use by EPs has not been widely investigated. Neither ECG score has been evaluated for correlation with RHS as determined by EP echo including TAPSE.

Objectives: We hypothesized high Daniels scores (≥10) or high TwiST scores (≥5) would correlate to having RV systolic dysfunction determined by TAPSE, and that Daniels scores and Twist scores would be higher, while TAPSE scores would be lower, in PE positive patients.

Methods: A prospective convenience sample of 105 patients undergoing CTA for suspected PE. ECGs were obtained, patients underwent an EP performed bedside echo and TAPSE was measured. EPs were blinded to CT results. Low TAPSE was defined as ≤17 mm. Daniels and Twist scores were compared to TAPSE using student's t-test and Fisher's exact test.

Results: We enrolled 105 patients, 23 were PE positive (PE+). Patients with low TAPSE had a mean Daniels score of 7.26 (±5.9) while patients with a TAPSE > 17 mm had a mean Daniels score of 2.5 (±2.5). Patients with low TAPSE had a mean TwiST score of 5.52 (±3.3) while patients with a TAPSE > 17 mm had a mean TwiST score of 1.79 (±2.4). Mean Daniels scores and TwiST scores were significantly different between low and high TAPSE groups ($p<0.0001$), and high Daniels and TwiST scores correlated to low TAPSE ($p<0.0001$ and $p=0.0002$ respectively). PE+ patients had a significantly lower mean TAPSE value of 17.6 mm (±5.0) compared to 22.2 mm (±5.3) in PE negative (PE-) patients ($p=0.0003$). PE+ patients had a significantly higher mean Daniels score of 5.95 (±6.05) compared to 2.96 (±3.24) in PE- patients ($p=0.0024$). PE+ patients had a significantly higher TwiST score of 4.38 (±3.46) compared to 2.24 (±2.77) in PE- patients ($p=0.0033$).

Conclusion: Both the Daniels and TwiST ECG scores correlated with TAPSE by EP echo, and all three were predictive of PE on CTA. Further research is needed to determine relative contributions of ECG and bedside echo findings for diagnosis and prognosis of PE.

Differences in mean ECG scores for low vs. high TAPSE and PE+ vs. PE-

	Daniels	TwiST	
TAPSE ≤17 mm Mean (±SD)	7.26 (±5.9)	5.52 (±3.3)	
TAPSE > 7mm Mean (±SD)	2.5 (±2.5)	1.79 (±2.4)	
Difference (95% CI)	4.76 (3.1-6.4)	3.73 (2.5-5)	
Level of significance	p<0.0001	p<0.0001	
	Daniels	**TwiST**	**TAPSE**
PE + Mean (±SD)	5.95 (±6.05)	4.38 (±3.46)	17.6 mm (±5.0)
PE – Mean (±SD)	2.96 (±3.24)	2.24 (±2.77)	22.2 mm (±5.3)
Difference (95% CI)	2.99 (1.1-4.9)	2.14 (0.729-3.55)	4.62 (2.18-7.1)
Level of significance	p = 0.0024	p = 0.0033	p = 0.0003

Table 446: Grotberg.

447 Effectiveness of the "Transport Plus" Intervention: Discharge Comprehension Assessment

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Background: Older adult patients experience high rates of return ED visits and readmissions following hospitalization due in part to imperfectly understood discharge instructions. "Transport PLUS" expands the role of Emergency Medical Technicians (EMTs) by adding simple interventions, such as a Discharge Comprehension Assessment (DCA), to routine ambulance transports home from the hospital to improve the transition of care. Previously reported feasibility data demonstrated 92.7% patient acceptance of the intervention with a knowledge deficiency found in 21.9% of encounters.

Objectives: To evaluate the effectiveness of EMT's performing a DCA as measured by awareness of discharge instructions and compliance with follow up appointments at 1 month post-discharge.

Methods: The Transport PLUS DCA was piloted among patients over age 65 transported home from the hospital by ambulance between November 2013 and June 2014. The intervention consists of an EMT assessing the subject's (or caregiver's) awareness of 6 elements of a high quality transition of care using the Transport PLUS checklist. If a deficiency is identified, the EMT reinforces the written discharge instructions with the patient. If the written instructions are incomplete, the EMT or project coordinator re-contacts the hospital care team. Phone surveys at approximately 4 weeks post-intervention measured awareness of the post-discharge care plan, and whether the patient successfully followed up for outpatient care.

Results: Out of 521 DCA's performed during the study period, 364 (69.9%) patients and/or caregivers were successfully surveyed at an average interval of 39 days post discharge. 83.3% of respondents reported that the DCA was either helpful or very helpful. Patients and/or caregivers were able to demonstrate knowledge of red flags symptoms and outpatient follow-up instructions in 88.3% and 96.0% respectively. 251 (69.0%) had successfully attended their follow up appointment.

Conclusion: This study demonstrates high rates of patient satisfaction and compliance with discharge instructions among those who received the Transport PLUS DCA. Further studies are needed to determine its effectiveness on clinical outcomes such as hospital readmissions and return ED visits against a control population.

448 Reimbursement is Poor for Emergency Ultrasound Studies Performed in 3 Large, Urban Hospitals Despite Wide Payer Mix

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Background: Emergency ultrasound (EUS) is a critical diagnostic and procedural tool in the ED, and its use is eligible for reimbursement as a separately billable procedure. As EUS is increasingly part of standard EM training and patient care, maximizing appropriate reimbursement for this valuable service is increasingly important.

Objectives: The objective of this study was to correlate EUS reimbursement rates with claim characteristics such as insurance carrier and denial codes.

Methods: This was a retrospective, multicenter, chart review of all patients who were billed for an EUS after a visit to one of 3 urban, academic EDs. McKesson, which provides the coding and billing services for these EDs, provided a report of all EUS studies submitted for billing during the 8-month study period. EUS studies were reviewed for successful payment, reasons for denial, and associated insurance carrier. Descriptive statistics were used to analyze the data.

Results: 3,015 EUS studies were submitted for billing between January and August 2015, for a total of $458,802 in claims. Of those claims, 1,291 (42.8%) were eventually paid, but resultant income only totaled $45,317 (9.9% of initial claims). 86 different payers were identified. No payer was listed for 11.3% of claims, yet 1.5% of those claims were paid. The most frequently listed payers were Health First (22.8%), followed by Medicaid NY (9.6%), Medicare Part B (8.5%), Blue Shield of Empire NY (8.0%), Fidelis Care (7.7%), and Metroplus Health Plan (5.4%), which accounted for 62% of claims. While in aggregate, they paid only $28,872 (20.3% return on initial claims), this amounts to an appropriate proportion of total income derived from all claims (63.7%). Claims were denied due to 1 of 37 codes. Of denied claims, 57.4% did not have a reason listed. The most frequent denial codes were "non-covered charge" (10.7%) and "inclusion in payment for another service" (11.7%).

Conclusion: The majority of EUS claims at the 3 EDs studied were billed to insurance companies, and were denied, resulting in huge potential financial losses. Over half of denials did not include a reason code. Further study of claim denials, documentation and correlation with particular payers is warranted, as it may uncover methods for improvement in our billing process, improve provider and hospital reimbursement, and lessen financial burden on patients.

449 A Qualitative Analysis of the Knowledge, Attitudes and Behaviors Surrounding the Acute Care of the Ebola Virus Disease Outbreak

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Background: EM physicians, EM nurses, EMTs, and paramedics play a unique role in the preparedness for a potential Ebola outbreak.

Objectives: The purpose of this project was to examine the knowledge, attitudes and behaviors of these providers when caring for patients with suspected/confirmed Ebola virus.

Methods: A convenience sample of 22 EMTs/paramedics (EMS), 20 EM physicians, and 23 EM nurses were recruited from an emergency department at a designated Ebola center. Each provider participated in one of nine on-site focus groups. Participants answered questions about how they acquired knowledge about Ebola, how they prepared to care for patients with the disease, and how they made decisions about whether or not they would care for these patients. Participants also discussed areas for improvement. Focus groups were recorded, transcribed, and coded using inductive content analysis.

Results: Preliminary analysis shows a perceived lack of adequate and reliable sources of information on the Ebola virus across all groups. The majority citing the internet and last minute in-service trainings as their primary sources of information. Majority of providers understand the Ebola virus is dangerous, but feel they are more likely to become infected with more common diseases like hepatitis or Tuberculosis. All groups expressed some hesitancy about caring for potential Ebola patients; EMS providers reported the least hesitancy, while nurses expressed the most. The most commonly cited reason for hesitation was family, followed by inadequate preparation and lack of financial reimbursement if the provider had to be placed in quarantine. EMS and nurses recommended live drills to improve knowledge and preparedness for future infectious disease outbreaks. Physicians recommended more provider inclusion when developing policies.

Conclusion: First responders have limited knowledge, feel under-prepared, and are hesitant about caring for suspected/confirmed patients with the Ebola virus. Results from this study may inform the development of effective interventions aimed at increasing provider preparedness and self-efficacy when caring for patients with high mortality infectious diseases.

450 ED Physician Adherence to IDSA Treatment Guidelines for Skin and Soft Tissue Infections: Risks of Deviating from Standard Therapy

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Background: The Infectious Disease Society of America (IDSA) updated their guidelines in 2014 for the treatment of skin and soft tissue infections (SSTIs). It is unknown how well emergency department (ED) physicians follow these guidelines.

Objectives: Our objectives were to describe the rates of guideline adherence and factors that influence antibiotic use in an outpatient ED setting, as well as to examine associations of treatment outcomes of practice not in accordance with these guidelines.

Methods: This retrospective cohort consisted of patients ages 18 years or older from 3 community and 1 academic ED, from May through June 2014, who were diagnosed with a SSTI. Charlson Comorbidity Index (CCI) score, visit location, and patient's sociodemographic characteristics were extracted by chart review. Patients were followed for one month to assess the outcome of treatment failure. Over and under-treatment were defined by IDSA criteria. We used multivariate logistic regression to assess predictors of treatment misclassification and failure of ED treatment, adjusted for the contributions of other variables

Results: We reviewed the medical records of 602 SSTI patients, of which 55% were treated in the community. The average age was 42 years with 48% female and an average CCI score of 0.38. Treatment regimens matched IDSA recommendations only 44% of the time. Patients seen in the community ED were 72% more likely to be over-treated (OR 1.72; 95%CI 1.27, 2.47) compared to those in the academic ED. In the academic setting, women were more likely to be under-treated, (OR 3.80; 95%CI 1.14, 12.63) while in the community setting, men were more likely to be over-treated (OR 2.02; 95%CI 1.01, 4.07) after adjustment for age, ethnicity, CCI score, and infection type. Among patients with follow-up data, 17% failed initial therapy. Patients treated in accordance with the IDSA guidelines were 60% less likely to fail treatment (OR 0.40; 95%CI 0.17, 0.96) after multivariable adjustment.

Conclusion: The treatment of SSTIs poorly followed IDSA guidelines and varied by gender and ED setting. Deviation from IDSA guidelines increased the patient's risk of failing treatment. By following the standardized protocols set forth by the IDSA, physicians can reduce unnecessary antibiotic use while improving patient outcomes.

451 Patterns and Predictors of Antibiotic Treatment for Patients with Dental Infections in U.S. Emergency Departments

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Background: Dental pain has an adverse effect on quality of life, accounts for 1.4% of all ED visits, and is increasing at a rate of 4% annually. First-line therapy for dental pain of infectious etiology includes incision and drainage or tooth extraction, with no evidence to support routine use of systemic antibiotics. Little is known regarding patterns and predictors of antibiotic treatment for ED patients with uncomplicated dental infections.

Objectives: To determine the rate with which ED patients with uncomplicated dental infections are treated with antibiotics, compare the relative proportions of specific antibiotics prescribed, and identify predictors of antibiotic treatment.

Methods: Using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) we analyzed 2009 and 2010 stratum-specific ED visits. The population was defined as patients with uncomplicated dental infections, identified by ED primary diagnoses corresponding to ICD-9 codes for pulpitis, apical periodontitis, and periapical abscess without or without sinus. Visits for diagnoses suggesting cellulitis or abscess of the mouth were excluded. The primary outcome was treatment with any antibiotic. Descriptive statistics were used to summarize the overall rate of antibiotic therapy, and the relative proportions of the specific antibiotics prescribed. Multivariable logistic regression was used to identify variables associated with antibiotic treatment.

Results: There were 182 records in NHAMCS which met inclusion criteria, corresponding to an estimated 796,122 ED visits for uncomplicated dental infections. Antibiotic treatment was administered in an estimated 86.4% (95%CI 77.31, 92.21) of visits. Among those treated, penicillin (45.54%) and clindamycin (34.38%) were prescribed most commonly (See Tichter Figure 1). Multivariable logistic regression identified private insurance (OR 0.21) and performance of an incision and drainage in the ED (OR 99.47) as being independently associated with antibiotic treatment (see Tichter Table 1).

Conclusion: Despite lack of evidence suggesting benefit, antibiotics are prescribed for the majority of ED patients with uncomplicated dental infections. Despite being definitive, treatment with I&D is the strongest predictor of antibiotic therapy.

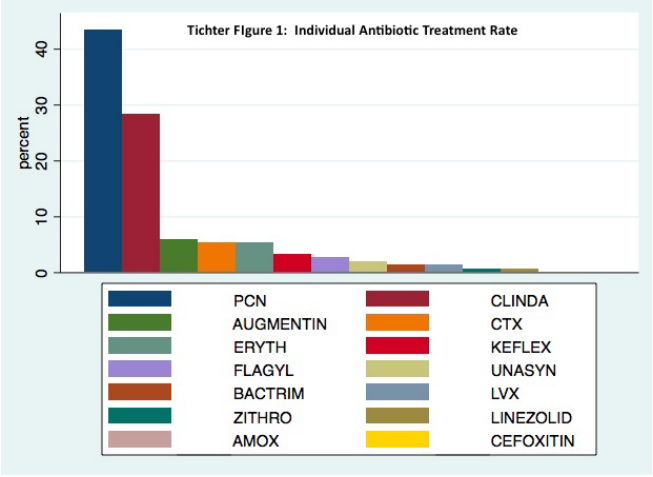

Figure 451 – Tichter

Multivariable Logistic Model of Antibiotic Treatment

	Odds Ratio	95% CI
AGE	0.99	0.95 – 1.03
SEX		
Male	2.51	0.57 – 11.03
RACE/ETHNICITY		
White, Non-Hispanic	reference	-
Black, Non-Hispanic	0.91	0.21 – 3.93
Hispanic	0.70	0.10 – 5.01
EXPECTED PAYMENT		
Non-private insurance	reference	-
Private insurance*	0.21	0.08 – 0.56
TEMPERATURE (F)	1.01	0.94 – 1.07
PAIN SCALE	0.90	0.71 – 1.15
HISTORY OF DIABETES	2.18	0.14 – 34.73
I&D IN ED*	99.47	8.02 – 1233.71

*p<0.05

Table 451: Tichter.

452 Failure of an Emergency Department Observation Protocol for Sickle Cell Vaso-Occlusive Crisis to Reduce 30-day Readmission Rates

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Background: Sickle cell disease (SSD) has one of the highest national 30-day readmission rates (31.9%). ED observation has been recommended in the SSD literature as an alternative to admission to decrease hospital readmissions, however, it's success has not been reported.

Objectives: Determine the effect of implementing a dedicated SSD vaso-occlusive crisis (VOC) ED Observation protocol on admission and 30-day readmission rates.

Methods: A pre-post design was used to evaluate a SSD ED observation protocol for patients with uncomplicated VOC who did not achieve sufficient relief of pain to warrant ED discharge home after up to three doses of IV pain medicine. Exclusions included SSD patients presenting without VOC and SSD patients presenting with complicated VOC; this later group was admitted to the hospital bypassing observation. All SSD patients diagnosed with an uncomplicated VOC were managed with an ED observation stay of 8 to 24 hours prior to hospital admission or discharge. All patients known to the SSD Hematology clinic had patient specific treatment recommendations from their hematologist in their electronic medical record to guide management.

Results: The study period was 227 days (7.5 months) including 372 SSD patient ED VOC visits; the control period was 260 days (8.5 months) including 344 SSD patient ED VOC visits. During the study period, 78 (21.0%) were treated and discharged from the ED, 64 (17.2%) were admitted to the hospital with complicated VOC, while 230 (68.2%) were placed in the observation unit; of these, following 8-24 hours of the treatment under observation, 95 (41.3%) were discharged home, and 135 58.7% were admitted to the hospital. The total morphine sulfate equivalents (MSE) administered with the first three doses of pain medicine increased from 29.1 MSE control (95%CI 27.4-30.9) to 39.1 MSE during the study period (95%CI 37.0-41.2, p <0.001, T Test). The admission rate for all VOC cases decreased significantly from 61.34% to 53.49% (Chi-Square, P< 0.05), but the readmission rates were not significantly different, 47% control, 50% during the study period.

Conclusion: Despite reducing the admission rates, our sickle cell observation protocol using patient specific treatment recommendations did not reduce 30-day readmission rates for patients with vaso-occlusive crisis.

453 Impact of Delayed Second Dose Antibiotics in Sepsis

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Background: Sepsis treatment requires timely fluid resuscitation and antibiotic administration. Most bacteria are killed by the first antibiotic (D1) administration; however delayed subsequent antibiotic doses may allow bacteria with some degree of resistance to survive. Delays may exist when transitioning care.

Objectives: To describe the delay in 2nd dose antibiotic (D2) administration and whether that dose was delivered in the ED, the inpatient holding area of the ED (APER), the ICU, or the inpatient floor. We how delays affected length of stay (LOS), requirement for mechanical ventilation, need for ICU, and mortality (following D2 administration). We hypothesized that delays in antibiotics would occur more frequently outside of the ED, thus negatively affecting patient outcome.

Methods: This is a review of severe sepsis and septic shock (SS/SS) patients admitted to an urban tertiary care center entered into a quality improvement database. *Inclusion criteria:* Diagnosis of SS/SS, D1 IV antibiotic administration in ED, D2 IV antibiotic administered. *Exclusion Criteria:* <18, advance directive precluding bundle, patient or surrogate declined interventions. *Study Assessments:* Clinical treatment data, mortality, LOS, ICU utilization, and need for mechanical ventilation. Descriptive statistics were used to assess clinical treatment data. Delays based on Sanford Guide. Mortality, LOS, ICU utilization, and need for mechanical ventilation were determined by T test or chi-square test as appropriate, with p values and 95% CI.

Results: A total of 225 charts were analyzed in 3 groups based on delay: no delay, delay < 25%, and delay > 25%. All ED patients received D2 without delay (n = 5). In APER, 69% received timely antibiotics, 12% had < 25% delay, and 19% had > 25% delay. In the ICU those numbers were 65%, 8%, and 28% respectively. Inpatient unit numbers were 55%, 22% and 22% respectively. Overall, 40% of the D2 administered outside of the ED were delayed and 25% by > 25%. There was no effect on LOS, delayed admission to ICU, need for delayed mechanical ventilation, or mortality.

Conclusion: While significant delays in second antibiotic administration were seen outside the ED, there was no apparent effect in this sample on mortality or patient outcome.

454 Identifying Acute HIV Infections: Unexpected Benefit of HIV Screening with a 4th Generation Testing Platform

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Background: To address the large proportion of HIV-infected individuals unaware of their HIV status (20%), the CDC expanded HIV screening recommendations in 2006 to include all healthcare facilities, including emergency departments. Rapid, point-of-care testing had been the mainstay of ED testing programs until the advent of lab-based 4th generation HIV testing platforms (e.g. Abbott Architect Analyzer HIV Ag/Ab), which result in approximately 1 hour. An additional advantage of this test is that it also identifies acute HIV infection within 14 days (20 days before western blots become positive), the time that patients are most infectious and may not know their HIV status. Acute HIV infection disproportionately contributes to new HIV infections when compared to chronic infection.

Objectives: To examine the impact of a lab-based 4th generation ED screening program on the detection of acute HIV infection.

Methods: We conducted a retrospective review of the 'R/O HIV in the LAC+USC ED' program for the 15 months before and after converting from a point-of-care testing procedure to a lab-based 4th generation program (4/12-9/14). The LAC+USC ED offers non-targeted testing of ED patients between ages 18 and 64 regardless of chief complaint. The primary outcome of interest was the number of acute HIV infections identified through this program. Acute HIV infection was defined according to CDC recommendation as detectable HIV RNA or p24 antigen, the latter often used in currently available HIV antigen/antibody combination assays, in the setting of a negative or indeterminate HIV antibody test.

Results: HIV testing increased from 8,983 tests in the 15 months before the 4th generation testing to 22,593 in the 15 months after. Similarly, the number of newly diagnosed HIV infections increased from 36 (0.4%) to 115 (0.5%). Zero acute HIV infections were identified prior to 4th generation testing while 14 acute HIV infections (12.2% of new infections) were diagnosed after. Acutely HIV- infected individuals had mean age of 34.8 years and 93% were male, 21.4% were African-American and 79% Latino. Median viral load in this group was 1.7 million copies/ml (3 cases had viral load >10 million copies/ml).

Conclusion: Converting to a rapid, 4th generation HIV testing platform made critically important acute HIV case identification feasible and resulted in identification of 14 acute HIV cases in an urban ED setting.

455 Shared Decision Making for Low-Value Testing in the Emergency Department

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Background: The emergency department is the focal point for rapid access to advanced diagnostic testing. Increasingly, clinicians are encouraged to involve patients in discussions regarding the value of testing.

Objectives: This study evaluated patient preferences regarding diagnostic testing in the emergency department with respect to tradeoffs between the test's benefit, risks and cost.

Methods: We surveyed patients in an adult emergency department and gave them a hypothetical scenario in which they had either low risk chest pain or a minor traumatic brain injury and gave them a defined benefit (chance of having heart disease or a brain bleed), risk (developing cancer within the next ten years from the test), and cost to receiving a CT scan. Benefit and risk were independently randomly assigned as 0.1% or 1% and cost was randomly distributed as either free or $100 additional out of pocket expense. The main outcome measure was whether or not they wanted the test. We fit multivariable logistic regression models to adjust for demographics, socioeconomic status and medical history.

Results: We collected responses from 900 patients. When given benefit increased from 0.1 to 1% the percent of people who wanted the test increased from 64.6 to 71.7% (odds ratio of 1.43, 95%CI 1.16-1.76). When given the same increase in risk the percent wanting the test drops from 69.7 to 66.6% which has an OR of 0.89 (95%CI 0.73-1.09). When looking at cost of zero versus $100, the percent of people who want the test decreased from 77.5 to 59% respectively with OR of 0.42 (95%CI 0.33-0.52). After accounting for all confounders in our dataset, this relationship persisted (table1). In the scenarios where benefit is greater than risk, increasing cost to $100 still decreases the absolute percentage of people wanting the test by 16.2%.

Conclusion: An additional copayment for testing reduces the desire of patients to have a test, when accounting for risk and benefit, particularly when both the benefit and risk were low. With the increasing movement away from physician directed care towards shared decision-making, we must factor in our patients ability and willingness to pay for potential treatment options. This study demonstrates that cost is a critical aspect of a patient's desire to have diagnostic testing.

Table 1. Percent of people who want a diagnostic test at each level of benefit, risk, and cost

	wants test % (n)	model 1 OR (95%CI)	model2 OR (95%CI)	model 3 OR (95%CI)	model 4 OR (95%CI)
Benefit 0.1	64.6 (578)	ref			
Benefit 1.0	71.7 (649)	1.43 (1.16-1.76)	1.42 (1.15-1.76)	1.44 (1.16-1.79)	1.45 (1.17-1.81)
Risk 0.1	69.7 (631)	ref			
Risk 1.0	66.6 (596)	0.89 (0.73-1.09)	0.89 (0.72-1.09)	0.88 (0.72-1.09)	0.89 (0.72-1.09)
Cost 0	77.5 (692)	ref			
Cost $100	59 (535)	0.415 (0.33-0.52)	0.4 (0.32-0.51)	0.4 (0.32-0.5)	0.4 (0.32-0.5)

Model 1 reflects the increase from the lowest to highest benefit, risk, and cost. Model 2 additionally accounts for income and level of education. Model 3 additionally accounts for age, sex, if respondent is a medical professional or not, race, and ethnicity. Model 4 additionally accounts for History of cancer and/or heart attack, and overall health.

Table 455: Porath.

456 Adaptation of DECISION+: A Training Program in Shared Decision Making on the Use of Antibiotics for Acute Respiratory Infections in Primary Care, to the Context of an Emergency Department —a Mixed Methods Study

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Background: Antibiotic overuse for acute respiratory infections (ARIs) is a significant problem in Emergency Departments (EDs). DECISION+, a 2-hour tutorial combined with an interactive workshop on shared decision making (SDM) about antibiotic use for ARIs combined to a decision aid to be used with patients, reduces patients' use antibiotics for ARIs in primary care, but has never been studied in EDs.

Objectives: 1) Assess the intention of ED physicians to adopt SDM about antibiotics in ARIs. 2) Identify barriers and facilitators about adopting SDM to decide about antibiotic use for ARIs in EDs.

Methods: An adapted version of DECISION+ (1-hour interactive seminar on SDM about antibiotics in ARIs) was offered to the physicians of an academic ED (Lévis, Canada) in November 2015. A validated questionnaire based on the Theory of Planned Behaviour was administered to participants before and after the seminar. This questionnaire contains three items measuring the intention to adopt SDM for antibiotic use in ARIs using a 7-point Likert scale (ranging from -3 to +3). We performed descriptive statistical analyses for demographic characteristics and a paired Wilcoxon signed-rank test to compare pre- and post-training intention to adopt SDM. One researcher led a debriefing session with the participants during which barriers and facilitators about implementing SDM and a decision aid regarding antibiotic use for ARIs were elicited and recorded. Two researchers content analysed audio material.

Results: 54% (14/26) of eligible physicians received the intervention (see Table 1 for demographic characteristics). The median intention to adopt SDM was 1 (IQR -0.3-1.6) before and 1.16 (IQR 0.6-1.6) after the seminar (P = .74). We identified 20 specific barriers to adopting SDM for deciding about AB use for ARIs in the ED (e.g., lack of time) and 13 facilitators (e.g., patient education before the consultation).

Conclusion: An adapted version of DECISION+ did not impact ED physicians' intention to adopt SDM for deciding about antibiotics for ARIs. Further studies must be conducted to adapt DECISION+ to the ED and also to assess its impact on the patient use of antibiotics for ARIs.

Demographic characteristics of participants	
Age, yr, median (IQR)	43 (34-50)
Male	57 % (8/14)
Emergency Medicine Training	CCMF: 71 % (10/14) FRCPC: 29 % (4/14)
Previous knowledge of SDM	71 % (10/14)
Perceived current use of SDM, median (IQR)	25 % (15-45)

Table 456: Létourneau.

457 Informing Patient-Centered Interventions to Reduce Asthma-Related Pediatric Hospitalizations Through Cluster Analysis of Administrative Hospital Data

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Background: Between 2002-2012 asthma-related hospitalizations of children nearly doubled in Camden, New Jersey.

Objectives: Understand patterns of asthma-related acute care utilization to inform patient-centered interventions to reduce potentially avoidable hospitalizations (PAH) for asthmatic children.

Table 1: Distribution of asthma and non-asthma ED visits and admissions for four patient clusters

	1 (n=1438)	2 (n=1244)	3 (n=3215)	4 (n=110)
ED visits with asthma Dx				
Mean	1.8248	3.3826	1.4274	6.4000
Minimum/Maximum	0/15	0/36	0/9	0/34
% no asthma ED visit	23.6	2.9	8.9	10.0
% 1 asthma ED visit	34.4	35.9	61.0	10.9
% 2-5 asthma ED visits	36.8	44.1	29.1	35.5
% 6+ asthma ED visits	5.2	17.2	0.9	43.6
Inpatient admissions with asthma Dx				
Mean	1.1606	0.2138	0.1359	4.7545
Minimum/Maximum	0/7	0/7	0/2	0/23
% no asthma admission	30.0	83.6	86.9	9.1
% 1 asthma admission	40.8	13.3	12.7	9.1
% 2-5 asthma admissions	28.5	3.1	0.5	44.5
% 6+ asthma admissions	0.8	0.1	0.0	37.3
ED visits with no asthma Dx				
Mean	7.5376	17.3432	4.1142	17.3545
Minimum/Maximum	0/25	3/104	0/12	4/41
% with no non-asthma ED visit	3.2	0.0	11.0	0.0
% 1 non-asthma ED visit	5.1	0.0	11.0	0.0
% 2-5 non-asthma ED visits	31.6	0.6	46.5	3.6
% 6+ non-asthma ED visits	60.0	99.4	31.4	96.4
Inpatient admissions with no asthma Dx				
Mean	1.4930	0.5105	0.2722	3.700
Minimum/Maximum	0/6	0/4	0/1	0/22
% no non-asthma admission	15.2	55.4	72.8	14.5
% 1 non-asthma admission	34.8	39.2	27.2	13.6
% 2-5 non-asthma admissions	49.9	5.4	0.0	52.7
% 6+ non-asthma admissions	0.1	0.0	0.0	19.1

Table 457: Abir.

Methods: The analysis is based on all-payer hospital claims data from the 2 Camden City hospitals and a free-standing ED for years 2002-12. Cluster analysis was conducted to classify pediatric patients according to their asthma-related hospital use: Total asthma-related ED visits and total asthma-related hospitalizations. The distributions were standardized using Z-scores before and after the variables were entered into the clustering model where typologies were generated using Ward's Method hierarchical clustering.

Results: 6,007 patients with asthma-related diagnoses were identified. Four typologies of asthma patients were determined based on cluster analysis (Table 1). Those in cluster 1 had high non-asthma ED use (mean = 7.5 visits over the years 2002-12) but moderate asthma-related ED (1.8) and inpatient use (1.2). Cluster 2 showed high ED use, particularly for non-asthma diagnoses (17.3), and low rates of asthma hospitalizations (0.2). 1 in 10 children had a mental health co-morbidity, and over half (54%) were seen at all 3 facilities. Cluster 3 tended to be "one time" asthma ED utilizers with moderate ED use for non-asthma conditions. Over one-third had been seen at only one facility. Cluster 4 revealed very high asthma and non-asthma ED (6.4; 17.4) and inpatient use (4.8; 3.7). 1 in 5 had a mental health co-morbidity, and over half (57%) had been seen at all 3 facilities.

Conclusion: Cluster analysis reveals patterns of acute care utilization and socio-behavioral complexity that can inform interventions geared at reducing asthma-related pediatric PAH. These results will inform guides for focus groups conducted with asthmatic adolescents and caregivers of asthmatic children to inform patient-centered interventions that will be implemented in Camden.

458 Evaluation of yhe Effectiveness of s Sepsis Alert Protocol on Key Patient-Centered Outcomes

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Background: Landmark trials such as ARISE, ProCESS, and ProMISE emphasized the importance of early broad-spectrum antibiotics and aggressive fluid resuscitation. However, achieving these objectives in the first 60 minutes of patient care is challenging.

Objectives: A novel nursing resource -intensive sepsis alert (SA) protocol went live March 1 and we hypothesized that this protocol would decrease time to 1st antibiotic, decrease ED length of stay (LOS), decrease hospital LOS, and 30-day mortality.

Methods: This was a retrospective chart review study conducted at a tertiary referral hospital in the southeast United States (90,000 ED visits). All data were abstracted from an electronic health record by four trained data abstractors. The control group was any patient after March 1 who had a diagnosis of severe sepsis or septic shock present on admission and was not a SA. The study group included all SA patients since March 1. Abstracted data included: mortality in ED sepsis (MEDS) score, LOS in the ED, LOS in the hospital, time 1st antibiotic, and 30-day mortality.

Results: There were 103 patients in the control group (no SA) and 219 patients in the study group (SA). The MEDS score was 11.0 in the study group and 7.6 in the control group ($p<0.05$). Time to 1st antibiotic was 1.6 hours in the study group and 6.7 hours in the control ($p<0.05$) and ED LOS was 5.7 hours in the study group and 8.7 hours in the control group ($p<0.05$). Hospital LOS was 8.8 days in the study group and 7.9 days in the control ($p>0.05$). Mortality at 30-days was 20.0% in the study group and 6.8% in the control group ($p>0.05$).

Conclusion: This study demonstrates that our SA protocol is effective in reducing time to 1st antibiotic and ED LOS for those patients with severe sepsis or septic shock. Unexpectedly, this study also suggests our providers use the SA protocol appropriately for very sick patients as the study group had a higher MEDS score and much higher mortality.

459 Patient-Centered Definition of the Successful Emergency Department Discharge: A Potential New Marker of Quality Care

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Background: Existing processes for emergency department (ED) discharge are sub-optimal, but evaluating interventions for improvement is limited by the lack of a standardized, patient-centered, outcome measurement. Currently used outcome metrics, such as 72-hour return visit rates, are limited by ascertainment bias, incentivize over-testing and over-treatment at initial visit, and do not reflect the full burden of disease and morbidity experienced at home following ED care.

Objectives: To assess candidate indicators of successful ED discharge for potential inclusion in an outcome measure.

Methods: Asthma was chosen as a model system for examining discharge success based on high prevalence of disease, frequency of related ED visits, and similarity in management across the lifespan. Participants were drawn from two tertiary care EDs. Parents of patients (pediatric) or patients (adult) with asthma completed a demographic survey, the Newest Vital Sign assessment of health literacy, a freelisting exercise and qualitative interview to assess definition of success following ED discharge. Providers were asked to complete the freelisting and a written questionnaire. Freelists were analyzed for saliency score using Anthropac software; interviews were transcribed, coded by two independent coders and themeswere developed by team consensus.

Results: 22 adult patients, 37 pediatric parents, and 25 providers were enrolled. Of the patients and parents, 38 had adequate health literacy and 44 had limited health literacy. Across all literacy groups, freelisting participants reported return to activity and lack of asthma symptoms as the most important markers of success, whereas providers were more likely to focus on compliance with medications and comprehension of instructions. Additional definitions of success from the qualitative interview included not needing to return to the ED, knowledge/reassurance, being able to access medications/supplies, and follow-up and environmental concerns.

Conclusion: Patients and parents provided a definition of post-ED success focused on symptom resolution and return to activity, neither of which would be measured by current metrics. These data provide novel concepts for inclusion in a subsequent patient-centered measure of the successful ED discharge.

460 Identifying Unmet Palliative Care Needs in the ED: Use of the 'Surprise Question' in Patients with Sepsis

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Background: Many patients present to the emergency department (ED) with significant palliative care needs. The 'surprise question' (SQ), *Would you be surprised if this patient died in the next 12 months?* has been used to identify patients with unmet palliative care needs in populations including those with cancer and end-stage renal disease.

Objectives: Little is known about the utility of the SQ in the ED, therefore, the purpose of this investigation was to evaluate the performance of the SQ as a prognostic tool in ED patients with sepsis.

Methods: We implemented a modified version of the SQ (*Would you be surprised if this patient died in the next 30 days?*) in our ED for all patients requiring admission to our level I, academic tertiary care hospital. Upon admission decision, emergency physicians responded to the SQ while entering transition orders. We extracted patient-level data from our EMR to evaluate the relationship between emergency physician response to the SQ and inpatient mortality, ICU use, acquisition of a palliative care consult, and utilization of a 'comfort measures' order set in patients with sepsis (MS DRG 870, 871, 872).

Results: During our four-month study period, 330 ED patients were admitted to the hospital with a diagnosis of sepsis; 55% (n = 182) were male, median age 71 years (range 0-97). Emergency physicians responded that they would not be surprised if the patient died (negative response) in 108 cases (33%) and in-hospital mortality was experienced by 9% of patients (n = 31). The risk of experiencing in-hospital mortality was 1.93 (95% CI:1.00-3.75) greater for those with a negative SQ response while the risk of utilizing ICU was 1.22 (95% CI:0.57-2.55) times greater, the risk of palliative care consult was 2.40 (95% CI:1.33-4.31) time greater, and the risk of 'comfort measures' order set use was 5.48 (95%CI:2.63-11.38) times greater than for those whose physician would have been surprised.

Conclusion: In this setting and sample of ED sepsis patients, the risk of in-hospital mortality, ICU utilization, palliative care consultation, and use of a 'comfort measures' order set were all greater for patients whose emergency physician affirmed that the patient's death would not surprise them. We conclude the SQ may hold promise as a simple way to identify patients who may benefit from a palliative approach early in their illness trajectory.

461 Impact of Total Opioid Prescriptions on Annual Adolescent Opioid Abuse

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Background: Opioid abuse is a growing problem in the United States. Much literature has focused on the prescribing practices of physicians and use by adult populations. However, there is limited data on the effect of opioid prescriptions on adolescent recreational misuse of these medications. Further understanding of this has implications for outreach, anticipatory guidance and parental education to prevent abuse in the vulnerable adolescent population.

Objectives: The objective of this study was to assess a relationship between total annual opioid prescription and adolescent opioid abuse.

Methods: This was an observational study using the National Poison Data System (NPDS) through the American Association of Poison Control Centers. The study population consisted of poison center calls regarding adolescents aged 13-19 years between 2005-2013 with a coding of "intentional-abuse" and an opioid ingestion. Opioid prescription estimates were generated using the National Hospital Ambulatory Medical Care Survey and National Ambulatory Medical Care Survey.

Results: There were a total of 4,186 adolescent opioid ingestion calls during the study period. There was an increase between 2005-2010 in both teen opioid abuse calls (617 in 2005 to 782 in 2010) and opioid prescriptions (approximately 78 million in 2005 to 108 million in 2010). Regional trends existed with the West having the lowest and the Midwest having the highest annual rate of teen opioid abuse calls per 100,000 teens (1.71 and 2.77, respectively). For a one unit increase in rate of annual opioid prescriptions per 100 persons, teen opioid abuse calls increased by 1.9% (95% CI: 0.9, 2.8%). The annual mean number of teen opioid abuse calls through Poisson regression modelling is 2.00 per 100,000 teens (95% CI 1.77, 2.27) for every 25 opioid prescriptions per 100 persons.

Conclusion: Concerns have been raised about opioid prescribing and use across the United States. This analysis shows an association between annual total opioid prescriptions and the number of poison center calls for adolescent opioid intentional abuse. Providers need to be aware of the nonmedical use of opioids by adolescents and educate patients accordingly. Further research is needed to understand whether these opioids are directly prescribed to the adolescent, their immediate household, or acquired elsewhere.

462 Assessing the Effectiveness of Community Health Workers (CHW) in the Emergency Department

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Background: As the prevalence of asthma is rising in the United States, the South Bronx has the highest rates of asthma emergency department (ED) visits and hospitalizations in the state of New York. We conducted this study to explore and provide some solutions to this problem.

Objectives: To assess the effectiveness of the CHW by measuring the Asthma Control Test (ACT) score and determining the number of post-intervention hospitalizations and ED visits.

Methods: A CHW enrolled 50 children under 14 years of age, who were visiting the ED because of asthma exacerbation. In addition to evaluating patient adherence to the asthma action plan and effective medication delivery, the CHW sought to identify potential asthma triggers such as dust, garbage, insects, mold, animals, paint, and toys. The total of these seven asthma triggers were then averaged per household for each of the four CHW visits. We compared ACT score, hospitalization and ED visits/year following this intervention. An ACT score below 19 indicates that asthma is inadequately controlled.

Results: Fifty children were enrolled. The mean age of the children was 5.2 +/-3.8 years. Pre-intervention hospitalizations for this population were 1.32 +/- 2.64 per year and unscheduled ED visits were 2.88 +/-4.08 per year. Post-intervention hospitalizations were less than once a year (.12 +/-.6) and unscheduled ED visits were 1.32 +/-2.04 per year. The average ACT score on the initial community worker visit was 18.66 +/-5.02 and on the fourth and final visit were 21.45 +/-4.03. The total number of identified asthma triggers of 2.76 +/-.30 per household during the initial visit was reduced in the final visit to 2.48 +/-.26 per household.

Conclusion: CHW intervention decreases both the number of hospitalizations and the number of unscheduled ED visits. Furthermore, the ACT score improved from inadequate control to adequate control in the first, second, third, and fourth visits. Based on this preliminary data, we believe the asthma education intervention program to be effective in reducing the burden of asthma on both the patients and the health care system.

463 An Intervention to Increase Knowledge and Utilization of the Low Risk Ankle Rule Among Pediatric Emergency Room Providers

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Background: The Low Risk Ankle Rule (LRAR) is a tool that can help pediatric emergency department (PED) providers reduce unnecessary x-rays by 63% without missing significant fractures. Fewer than 7% of PED providers use the rule and only 14% are aware it exists.

Objectives: To educate PED providers about the LRAR then determine self-reported use immediately and at 2 months. We also sought to determine barriers to use.

Methods: Providers at a PED with an annual volume of 94,000 were sent a survey assessing knowledge and use of the LRAR. Clinical scenarios were given to determine x-ray ordering practices. Respondents viewed a brief educational tutorial about the LRAR then were re-queried about x-ray ordering practices and asked likelihood of future LRAR use. A 2-month follow-up survey was sent to respondents and consisted of the same knowledge questions and clinical scenarios, along with questions about interim LRAR use, interim x-ray ordering, and barriers to LRAR use.

Results: 52/92 (56%) providers completed the initial survey and 49/52 (94%) completed the follow-up. Initial respondents were 64% female with 47% attending physicians, 29% clinical staff physicians, 18% nurse practitioners, and 6% fellows. Initially, providers reported obtaining x-rays on 83% of all ankle injury encounters. 22% had heard of the LRAR; 42% familiar reported using the tool "sometimes" and 8% "usually" or "always." Given a scenario in which no x-ray is needed by applying the LRAR, providers reported they would obtain one 83% of the time. Immediately after education, providers reported they would obtain an x-ray 32% of the time given the same scenario. 54% reported they would use the tool "sometimes" and 31% "usually" or "always." At 2 months, there was no significant change in reported x-ray ordering practices (80% vs. 83%). The most influential barriers to LRAR use were parental expectation of an x-ray followed by fear of missing a fracture.

Conclusion: Most PED providers were unfamiliar with the LRAR. After a brief tutorial, provider-reported intended use of the LRAR increased significantly. However, at follow-up, self-reported x-ray ordering practices and LRAR use were unaffected. Perhaps standardized tool usage, parental education, and reassurance that significant fractures are not missed could change future practice patterns.

464 A Proposed Milestone for Pediatric Emergency Medicine Point-of-Care Ultrasound Competency

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Background: The ACGME developed milestones for physician assessment in multiple sub-specialties. Point-of-care ultrasound (POCUS) is one of 23 designated milestones in emergency medicine (EM) however, there are no milestones for pediatric emergency medicine (PEM) POCUS competency.

Objectives: To assess PEM provider self-evaluation of POCUS skills using a modified assessment tool (MAT) based on the ACGME EM Milestones.

Methods: This was an electronic survey of PEM faculty and fellows at four Midwestern pediatric academic centers. The survey included questions on demographics, POCUS experience, and the MAT. Respondents rated their competency level using the MAT with two established PEM ACGME milestones included for comparison. All milestones were scored from level 1-5; 5 indicates highest competency. Fisher's exact test was used to evaluate the association between training level and previous ultrasound experience with respect to the MAT.

Results: The response rate was 89% (123/138); 70.7% were PEM attending physicians and 29.3% PEM fellows. Eleven percent reported no EM POCUS training and 17.4% reported no PEM POCUS training. On the MAT, 69.9% selected a competency of Level 1 or 2 for POCUS in pediatric patients. In contrast, 54.5% selected competency level 4 and 73.2% selected level 5 for general procedures and medical stabilization of pediatric patients not using POCUS. There was a statistically significant association between self-reported POCUS milestone competency and provider type ($p=0.04$), and previous POCUS training ($p<0.001$). All respondents without POCUS training selected level 1, and most of those with POCUS training selected level 3 or less (83.2%).

Conclusion: This regional multicenter study supports the feasibility of using a milestone-derived tool to self-assess PEM POCUS competency. Respondents reported lower POCUS competency as compared to other established PEM ACGME milestones. The majority rate themselves as having lower competency in POCUS despite training. With the increased use of POCUS in PEM, a measure of ultrasound competency for physicians is needed. Further studies could validate the use of this milestone nationally.

465 Use of Ultrasound in Pediatric Skin and Soft Tissue Infection

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Background: Soft tissue abscesses are common in the pediatric emergency department. Ultrasound (US) can be used to both diagnose soft tissue abscesses as well as guide drainage.

Objectives: We hypothesized that clinical failure rates would be less in pediatric patients with suspected skin abscess when evaluated with US or were drained with US guidance.

Methods: We performed a retrospective review of suspected pediatric skin abscesses at 4 emergency departments over a 2-year period. Cases were identified through electronic medical record complaints, discharge diagnosis, and US database records. Search words included abscess, bug bite, cyst. Cases where a soft tissue US was performed were also included. Patients with animal bites, surgical wound infection, foreign bodies or multiple bug bites were excluded. Data on US usage, findings and outcomes were abstracted to an electronic database. Failure of therapy was defined as the requirement of an additional incision and drainage (I&D) after the initial visit to the emergency department unless a planned delayed I&D was documented. Comparison between group with Fisher's Exact test.

Results: 340 patients were seen over a 2-year period with concern for a potential skin abscess. 129 (37.9%) patients underwent soft tissue US imaging during their visit. 216 underwent I&D during their ED stay, 88 with US guidance and 128 without. 124 patients were evaluated for suspected abscess but no I&D was performed, 41 with US and 83 without. 243 (71.5%) of the patients were diagnosed with an abscess, as defined by purulence on I&D or findings on US. 31(9%) patients failed therapy, 18(8.3%) after I&D and 13(10.5%) without initial I&D. There was no statistical difference in failure rates between US guided and blind I&D (4.6% vs 10.9%, p=ns). Total failure rates for patients evaluated with US was significantly lower then those evaluated without US (4.7% vs 11.8%, $p<0.05$)

Conclusion: The use of US during evaluation for suspected skin abscess reduced the amount of clinical failure rates. US guidance during evaluation for skin and soft tissue abscess should be encouraged.

466 The Evolution of Appendiceal Ultrasound: Ten Years' Experience Within a Pediatric Emergency Department

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Background: Appendicitis is a common, serious cause of abdominal pain in the pediatric population. While computed tomography (CT) and/or physical exam were once the only options for further evaluation of the appendix, ultrasound has increasingly been used to both speed up the diagnostic workup and spare pediatric patients from radiation. While ultrasound is helpful to visualize the appendix in many patients, obesity, bowel gas, non-classically located appendices, and other limitations can make ultrasound visualization impossible.

Objectives: To evaluate both the utility of and frequency of use of ultrasound for appendicitis over a ten year period.

Methods: We performed a retrospective review of ten years of data (2003-2013) from a radiology database in our tertiary, academic pediatric hospital. Inclusion criteria: abdominal US of children under 18 years old ordered in the pediatric ED for suspicion of acute appendicitis. US studies originating from outside hospitals were excluded. Additional information was obtained based on secondary imaging technique after ultrasound, type of provider (pediatric emergency medicine trained vs. emergency medicine trained), whether radiologists were primarily adult or pediatric focused, and information about surgical consult use and operative pathology reports.

Results: 2872 patients were identified who met the inclusion criteria. Ultrasound successful identified 97% (199/206) of pathology report confirmed cases of appendicitis within this dataset. In 2003, 36 patients in the pediatric emergency department underwent an ultrasound to diagnose appendicitis. By 2013, this number had increased to 670. The number of patients requiring CT after ultrasound decreased over this time period from 41.7% to 11%.

Conclusion: Ultrasound demonstrates a high sensitivity in the evaluation of appendicitis. In conjunction with this, ultrasound use has increased dramatically within the pediatric emergency department. Additionally, this increase in volume has occurred in the setting of a decrease need for CT scan use after ultrasound.

467 Publishing Venues for Education Scholarship: A Needs Assessment

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Background: Education research is a developing field. It is unknown if there are adequate venues for scholarship distribution.

Objectives: To identify the types of scholarly activity educators produce, where it is published, barriers to publication and perceptions of adequacy of publication venues.

Methods: Study participants were emergency medicine (EM) education leaders who completed an online survey consisting of multiple choice and 10 point rating scale items.

Results: 45/59 (76.3%) subjects completed the survey. 12/45 respondents had never published education scholarship. Most (29/44) felt that there were inadequate venues for publishing education scholarship. Of those who publish education scholarship, most (30/33; 90.9%) publish either <1 or 1-2 peer-reviewed products per year, but collaborate with others more frequently (<1 per year: 7/33; 1-2 per year: 17/33; 3-4 per year: 7/33; 5 or more per year: 2/33). The most frequently published scholarship were curricular innovations and original research; mean ratings 5.61 and 5.21 respectively. Peer-reviewed print journal was the most frequently utilized venue; mean rating 6.21. Other venues (mean rating) include: peer-reviewed online journal (4.0), MedEd Portal (3.58), free open access education (3.47), newsletter (3.0), and curricular toolbox (2.55). The most common rejection reason was "not suitable for this journal/venue"; mean rating 5.33. Other reasons include: research methodology (4.07), small sample size (4.17), single site study (4.28), and misunderstanding of project purpose (4.10). Educators believed additional education supplements in journals would be most helpful in increasing successful publication; mean rating 8.31. Other helpful items included a central online repository of venues that publish education scholarship, online training in education research design/methodology, and an online networking site of education researchers to promote collaboration; mean ratings of 6.88, 6.75, and 6.28 respectively.

Conclusion: EM education leaders do not uniformly publish education scholarship. There is a perceived lack of venues for this work. Multiple barriers as well as potential strategies for success have been identified. This information may inform interventions to support educators in dissemination of their scholarly work.

468 An Innovative Quality and Safety Curriculum for Emergency Medicine Residents

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Background: Emergency medicine (EM) malpractice data may provide important insights for EM residents during training.

Objectives: To evaluate the impact of a risk management curriculum developed with a malpractice insurance company.

Methods: 22 PGY1-3 EM residents attended a course on general malpractice principles and EM specific trends. Experts presented from Controlled Insurance Company (CRICO) which insures > 12,400 physicians including > 2300 residents, 100 of whom are EM. An EM specific curriculum included case rate statistics, allegations, contributing factors, cost analyses, disposition data, and recent trends. The next section detailed the proceedings of a lawsuit. Six months after the course, following IRB approval, 19 PGY1-3 residents (86%) completed an anonymous survey. Percentage scores and open ended questions were reviewed.

Results: For all CRICO cases (n=1,292 professional liability cases asserted between 1/1/09 - 8/31/14) EM is the 6th specialty in suit frequency, 5th in cost with >$51.7 million in payments. Common allegations were diagnosis 53% (42) and medical treatment related 32% (25). Curriculum discussed potential errors in EM; 5 key areas include historical information, real time clinical assessment, diagnostic tests, consultations, teamwork/communication. 100% (19) reported a better understanding of a malpractice case. 58% (11) felt it impacted their practice. 68% (13) agreed the program impacted documentation, 21% (4) were neutral, 11% (2) disagreed. 79% (15) increased MDM documentation. 32% (6) noted impact on communication skills, 53% (10) were neutral, 16% (3) disagreed. 47% (9) responded test ordering increased and 53% (10) stayed the same. 42% (8) felt that before the program malpractice risk impacted clinical decision making compared to 63% (12) afterwards. 74% (14) increased review of nursing documentation. 90% (16) of residents increased their documentation of discussions with consultants. 74% (14) increased use of closed loop communication with nurses. 79% (15) residents reported a positive impact on discharge instructions, particularly if pending results.

Conclusion: Review of malpractice data impacted EM resident documentation practices, communication with nurses and consultants, increased test ordering and attention to discharge instructions.

469 Exploratory Factor Analysis of Faculty Ability to Differentiate Individual Core Competencies During Evaluation of Resident Clinical Performance

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Background: Milestone evaluations of resident clinical performance have been included as part of evaluations by the Residency Review Committee of Emergency Medicine (RRC-EM). Despite the use of these evaluations by most residency programs, little research has been done to evaluate the metrics of patient evaluations.

Objectives: We sought to determine the ability of ED faculty to differentiate individual core competencies when asked to evaluate resident clinical performance.

Methods: This prospective observational study was conducted at an urban academic emergency department with a PGY 1-3 format emergency medicine residency program comprised of 30 residents. Each resident was evaluated by the faculty over a 1.5 year period on a competency based evaluation questionnaire. The questionnaire was administered online and resident performance on 8 competency based items was rated on a fixed 9 point scale. Pearson correlation coefficients across each resident's score for the competency based questions were calculated and analyzed in a correlation matrix.

Results: During the 1.5 year period of the study approximately 25 faculty members evaluated the 30 residents yielding a total of 613 evaluations. To determine whether faculty were able to separate and rank residents on the individual competencies we compared Pearson correlation coefficients across each resident's score for the competency based questions. The resulting correlation matrix yielded 36 combinations. The patient rankings for all of these scores were highly correlated. The correlations ranged from 0.91 to 0.97 and all were significant at $p<0.001$.

Conclusion: When faculty evaluate resident performance using a competency based evaluation form, the results obtained across multiple competency based questions are highly correlated. Faculty do not discriminate well between individual competency based constructs when performing clinical evaluations of residents.

470 Intern's Self-Perceived Procedural Competency and the Impact of a Single Hospital-Wide Procedure Training Session

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Background: Interns enter residency with variable experience in performing procedures and are expected to execute them safely on patients from the first day of clinical duties. The self-perceived procedural competency of incoming interns across all specialties is unknown.

Objectives: We aimed to determine the baseline self-perceived procedural competency of interns entering residency. Our secondary aims were to assess the impact of a hospital-wide procedure-training session and through analysis of pre- and post-course self-perceived competency, direct future efforts in procedural education for early trainees.

Methods: We performed a single-center, cross-sectional, cohort study surveying 298 incoming interns during hospital orientation in June 2013 and 2014 on their self-perceived competency levels for performing A-line placement, suturing, intraosseous (IO) device placement, central venous catheter (CVC) placement, and defibrillation. Pre and post-course four-point Likert scale surveys were administered. Data were analyzed using repeated measures ANOVA and amalgamated into two clinically relevant groups- 1) unable to perform/perform with major assistance and 2)perform with minor assistance/perform independently.

Results: We analyzed a total of 295/298 (99%) pre-course and 280/298 (94%) post-course surveys. Perceived competency levels improved significantly for all procedures. The mean perceived competency for IO placement, defibrillation, and A-line placement improved to "perform with minor assistance/perform independently". Mean competency for CVC placement remained in the "unable to perform/perform with major assistance" category (mean pre-course 1.90, post-course 2.62). The change in perceived competency levels varied, with the largest improvement seen in IO placement (mean pre-course 1.71, post-course 3.27).

Conclusion: Participants, representing a spectrum of medical schools and specialties, rated their pre-course perceived competency as low for most procedures suggesting the need for additional procedural training prior to starting residency. The variability in the levels of perceived competency improvement for specific procedures should assist with refining the focus of procedural curricula at the medical school and post-graduate levels.

471 Are All Milestones Equal in the Eyes of Residents? A Multicenter Cross-Sectional Study of Emergency Medicine Residents

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Background: Feedback, particularly real-time feedback, is critical to resident education. The emergency medicine (EM) milestones were developed in 2012 to enhance resident assessment and many programs utilize them to provide focused resident feedback.

Objectives: The purpose of this study was to evaluate EM residents' level of interest in receiving real-time feedback on each of the 23 milestones.

Methods: This was a multicenter cross sectional study of EM residents. Participants were surveyed on their level of interest in receiving real-time feedback on each of the 23 milestones. Anonymous paper or computerized surveys were distributed to residents at three 4-year training programs and one 3-year training program with a total of 116 resident respondents. Residents rated their level of interest in each milestone on a 6 point Likert-like scale. Average level of interest was calculated for each of the 23 milestones, both as an average of all 116 respondents as well as by individual postgraduate year (PGY) level of training.

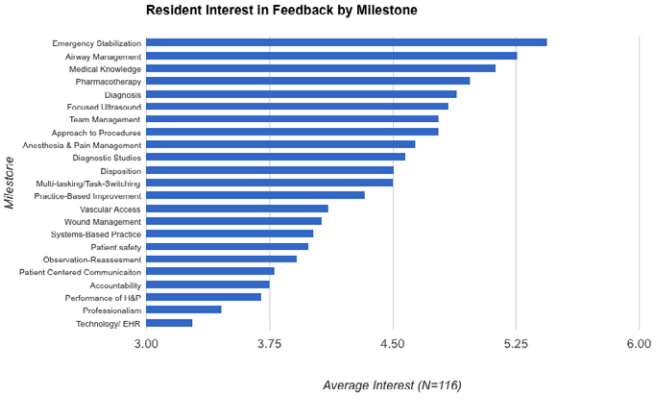

Figure 471 – Noelker

Results: The survey response rate was 59%. Residents had greater interest in receiving feedback on certain milestones than others. Interest in some milestones was dependent on the resident PGY level, however all PGY levels had the overall greatest interest in receiving feedback on emergency stabilization (PC1) and the least overall interest in receiving feedback on technology/electronic health records (SBP3). These findings, as well as data for the other 21 milestones, are found in the attached graph.

Conclusion: Residents ascribe much more value to certain milestones than others. This may have consequences for what type of feedback is sought by residents as well the value they place on feedback received from faculty. Awareness of residents' milestone valuing needs to be considered when developing an assessment program that should ideally place equal importance on all 23 EM milestones.

472 Quality Improvement of Resident Charting: An Online Educational Approach

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Background: Studies show Emergency Medicine residents are not confident in their knowledge of medical record documentation and coding procedures, or of charges for services rendered in the emergency department (ED). This results in an overall dissatisfaction with charting. Prolonged time spent charting after shift contributes to this dissatisfaction. Educational interventions can increase resident billing and coding charges, however, these have been predominantly lecture-based.

Objectives: We aimed to create an online interactive educational module on ED charting intended for residents, and to assess its impact on satisfaction with charting, time spent charting after shift, and understanding of billing and coding practices.

Methods: Baseline data on satisfaction with charting, time spent charting after shift, and billing familiarity were gathered from all 53 residents enrolled in an ACGME-accredited Emergency Medicine residency. Residents then viewed the online interactive module which provided instruction on increasing charting efficiency, improving quality of charting, and taught the basics of Evaluation and Management Coding (EMC). The majority of residents spent 15-30 minutes completing the module. Residents were then later surveyed to assess the effect of the module on their charting and their retention of information presented.

Results: Residents reported increased efficiency with charting, with greater satisfaction, and improved understanding of EMC after the intervention. Prior to the intervention only 19 residents (36%) were satisfied with electronic charting versus 41 residents (77%) after the intervention ($p < 0.0001$). Prior to the intervention, 30 residents (57%) reported spending over an hour after shift charting. Only 14 residents (27%) spent more than an hour after shift charting after completing the module ($p = 0.0016$). 26 residents (49%) were familiar with EMC prior to the module, compared to 44 residents (83%) after the module ($p = 0.0002$).

Conclusion: An online interactive module is an effective and efficient asynchronous learning tool to improve resident charting satisfaction, efficiency with charting, and understanding of EMC principles, with retention of information over time.

473 Frequency of Smoking Cessation Counseling and Smoking Cessation Discharge Instructions in the Emergency Department

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Background: Tobacco dependence is the leading cause of preventable death and disease in the U.S., and tobacco use is common among emergency department (ED) patients. Population health management of at-risk populations is increasingly becoming an important area for healthcare systems and their providers to address. Moreover, the Patient Protection and Affordable Care Act mandates Medicaid coverage of smoking cessation medication, and there are billable codes for brief smoking cessation counseling (3 minutes) that can be done in the ED setting. Good evidence exists that education and intervention by physicians is effective, even in the ED setting. However, smoking cessation counseling and discharge instructions about smoking in the ED setting are often underutilized.

Objectives: Our objective is to determine the proportion of emergency department patients who report current smoking of tobacco cigarettes that were counseled to quit or received smoking cessation instructions in their ED discharge instructions.

Methods: This was a retrospective chart review of a random sample of ED visits occurring between March 1, 2014 and April 30, 2014. The ED was part of an urban tertiary care center with approximately 70,000 patient visits per year and an affiliated EM residency program. Charts were randomly selected using Microsoft Excel randomization feature. Trained reviewers utilized a standardized chart abstraction tool built into an Excel spreadsheet. Charts were reviewed for evidence of current tobacco smoking (history of present illness and social history), any documentation of counseling while in the ED regarding tobacco abuse, and discharge instruction information regarding hazards of smoking and/or information regarding smoking cessation. Proportions with 95% confidence intervals are reported.

Results: There were 8,997 total ED visits during the study period of which 600 charts were randomly selected for inclusion. 71.3% (428/600) (CI: 0.6759-0.7481) denied current tobacco smoking, while 28.7% (172/600)(CI: 0.2519-0.3241) reported current tobacco use. Only 4/172 (2.3%) (CI 0.0091-0.0583) patients who reported tobacco smoking received documented smoking cessation counseling, 2/172 (1.16%)(CI 0.0032-0.0414) of which were provided smoking cessation information in the ED discharge instructions.

Conclusion: Emergency medicine providers have a low rate of documented discussions regarding tobacco cessation with their patients, and these patients are rarely given discharge instructions about smoking cessation. These results suggest that we are missing an important opportunity to improve public health.

474 Using Curtailment to Shorten an Opioid Abuse Risk Screening Tool in the ED

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Background: We previously demonstrated that the Screener and Opioid Assessment for Patients with Pain (SOAPP-R), a 24-question prospectively derived and validated screening tool, is feasible to administer in the ED, correlates with prescription drug monitoring program (PDMP) data, and can be completed by patients on a tablet computer.

Objectives: We now aim to determine if curtailment can be used to shorten the length of the screening tool to make it more practical for the ED environment. Curtailment is a process whereby the screening tool stops either when the score reaches the at-risk level or when it would be impossible to reach the at-risk level with the remaining questions. The test characteristics (e.g. sensitivity, specificity) remain the same with this technique.

Methods: This was a secondary analysis of a prospectively enrolled, cross-sectional, convenience sample of ED patients 18 years and older that were being considered for discharge with a prescription for an

opioid pain medication. Participating subjects completed SOAPP-R on an electronic tablet. Scores ≥18 on SOAPP-R are defined as "at-risk". We applied curtailment to each respondent's answers and calculated the length and time it would have taken had curtailment been used at the time of study administration. Curtailment times were determined by multiplying the average time per question each patient required by the number of questions they would have answered with a curtailed screener.

Results: The data from 82 patients were analyzed. 32.9% (n=27) were determined to be "at-risk" (score ≥18) by SOAPP-R. The average time it took patients to complete the entire screener was 164.0 (SD 74.3) seconds. Curtailment shortened the questionnaire 85.4% of the time. The mean number of questions asked would be 19.1 (SD 5.3, range 5-24). The mean time for completion would be 128.0 (SD 64.7) seconds, a difference of -36.1 (95% CI -25.6 to -46.6) seconds.

Conclusion: Using curtailment, we would have reduced the length of the screening tool for the vast majority of patients. This technique, applied to tablet computer administration of screening tools, may be useful in the ED setting where time for screening is limited.

475 How Do One-Question Screening Strategies Compare to a More Comprehensive Substance Use Assessment in Identifying Adult Emergency Department Patients Who Might Need an Intervention?

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Background: Efficient and efficacious strategies are needed to identify adult emergency department (ED) patients who might need a substance use intervention.

Objectives: To examine how one-question screening strategies that could be used at triage or incorporated into electronic medical records compare to a more comprehensive assessment in identifying patients who might need a substance use intervention.

Methods: From July 2010-December 2012, we assessed the need for substance use interventions among a random sample of English- or Spanish-speaking 18-64-year-old ED patients using the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). We compared the test performance characteristics (sensitivity, specificity, and positive/negative predictive values [PPVs/NPVs] with 95% CIs of three one-question screening strategies against the complete ASSIST as the "gold standard" to identify patients who might need a brief intervention or a more intensive intervention. The three one-question screening strategies were derived from the complete ASSIST and queried patients about any lifetime, any past 3-month, and past 3-month frequency of use of alcohol, smoking, and 12 types of drugs.

Results: Of 6,432 adult ED patients, their median age was 37 years, 56.6% were female, and 61.6% were white. As compared to the complete ASSIST, the one-question screening strategies varied markedly in their abilities to identify patients who might need interventions. For example, querying about any past 3-month use performed well in identifying patients who might need any intervention for smoking (PPV: 95%; 95% CI: 94-96%), moderately well for marijuana (PPV: 81%; 95% CI: 79-83%), but poorly for alcohol (PPV: 26%; 95% CI: 25-28%). In identifying those who might need a more intensive intervention, asking about past 3-month frequency of use performed best among the one-question screening strategies, yet its yield was poor overall (smoking PPV: 26%; 95% CI: 24-28%, marijuana PPV: 24%; 95% CI: 20-27%, and alcohol PPV: 39%; 95% CI: 34-43%).

Conclusion: Although their simplicity makes incorporation into ED practice enticing, one-question screening strategies demonstrate great variability in identifying adult ED patients who might need a substance use intervention. EDs must weigh cautiously using these strategies instead of more comprehensive assessment instruments.

476 Hypoglycemia is a Common Complication of Insulin Administration for Treatment of Hyperkalemia in the ED

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Background: Hyperkalemia is a common and potentially life threatening condition that can be rapidly fatal if left untreated. Insulin is a common therapy to shift potassium to the intracellular space; insulin also reduces serum glucose. The frequency of hypoglycemia after insulin administration for hyperkalemia is not known.

Objectives: To describe the frequency of hypoglycemia after insulin is administered for hyperkalemia.

Methods: This is a retrospective observational cohort study at a high-volume urban Level I trauma center of any ED patient 18 years or older found to have a potassium level > 5.3 mEq/L from January 2010 to June 2015; values of elevated potassium from hemolyzed specimens were excluded. All data was pulled directly from the electronic medical record. Laboratory values and treatments administered in the ED were collected. Hypoglycemia was defined as a glucose < 50 mg/dL within 2 hours after insulin administration.

Results: 1,974 patients with hyperkalemia were identified; of these 433 (22%) received insulin in the ED. The mean (SD) doses of insulin and co-administered dextrose 50% was 9.7 (3.7) units and 34 (28) grams, respectively. Thirty-five (8%; 95% CI 5.5 to 10.7%) of those who received insulin developed hypoglycemia; 31 (89%) of these patients had dextrose 50% co-administered with insulin.

Conclusion: The use of insulin for shifting of severe hyperkalemia is not without risk; a significant proportion of patients developed hypoglycemia after insulin administration, despite most receiving dextrose 50% simultaneously. Omitting insulin, reducing the insulin dose, or increasing the dose of dextrose may decrease the risk of hypoglycemia.

477 Multiple Previous Visits (MPV) Program: Effectiveness of a Patient-Centered Coordinated Care Team on Decreasing Frequent User Visits

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Background: In the Emergency Department (ED) there is a subgroup of patients that contribute to a disproportionate number of ED visits while utilizing a large amount of healthcare resources. In an effort to identify patients with a high number of ED visits and address their specific needs, a multi-disciplinary team called the Multiple Previous Visits (MPV) program was established.

Objectives: This study's objective is to evaluate the efficacy of the MPV program in reducing frequent user visits in a high-volume urban ED.

Methods: This is a retrospective study on patients enrolled in the MPV program that services an urban academic ED with an annual census of approximately 100,000 patients. We compared the number of ED visits 6 months pre- and post-enrollment in the MPV program. All patients who have been enrolled for less than 6 months were excluded. Patients who qualified for the program had at least 3 visits in the 3 months prior to enrollment and had to be willing to participate in the interventions proposed by the team. We utilized a one-sided sign test to assess the data.

Results: Sixteen patients met the criteria for inclusion in this study. 87.5% of participants decreased their overall ED visits, and 37.5% decreased their visits by at least 50%. One participant had zero ED visits after the date of enrollment. We found the overall decrease in ED visits among all participants was statistically significant (p=0.0021). Two participants saw no decrease (12.5%).

Conclusion: The MPV program significantly reduced the number of visits to the ED of enrolled patients. We therefore find that the MPV program is successful at reducing patient ED visits at our institution. It may be inferred from our data that similar multidisciplinary teams may decrease ED visits in a select group of individuals.

478 Asthma Bouncebacks Emergency Department Discharges Who Return as Admission Within Three Days

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Background: According to the CDC, about 8.0% (18.7 million) of adults currently have asthma in the US, accounting for 14.2 million annual ED visits for asthma related issues.

Objectives: To identify and describe patients discharged from an ED with a primary diagnosis of asthma who are admitted within 3 days of the discharge to potentially identify factors that might be used for predicting outpatient management failure.

Methods: This was a multi-center retrospective longitudinal cohort study of ED visits in 325 hospitals in California using non-public OSHPD (Office of Statewide Health Planning and Development) data for patients older than 18 years in 2013. The 3-day post ED discharge admission rates were calculated and the admission diagnosis related groupings (DRGs) were reported. Logistic regression was used to assess independent associations between characteristics of those who were discharged from the ED and returned within three days and those who did not.

Results: During the study period there were a total of 62,504 patients who were discharged from an ED with 83,884 visits diagnosed as asthma. A total of 1,322 patients (2.1%) were admitted within the 3 day follow-up period. 61,182 patients were not admitted within 3 days of discharge. 36.9% were age 18-44, 41.1% age 45-64 and 21.9% over 65 in the group with admissions within 3 days. 54% were age 18-44, 32.1% age 45-64, 13.8% 65 and older in the group without admissions within 3 days. 26.2% had private insurance, 30% had Medicare, 26.2% had Medi-Cal as their primary payer in the group that had admission within 3 days. 40.6% of patients had private insurance, 28.0% had Medicare, and 21.0% had Medi-Cal in the group that was not admitted within 3 days. The most common admitting DRGs were bronchitis and asthma both at 32.4%, and COPD at 23.0% for the group with admission within 3 days.

Conclusion: 2.1% of patients who were discharged from an ED with a diagnosis of asthma were admitted within 3 days. Differences were observed in patient age and patient payer status between the group which had admissions within 3 days and the group that did not.

479 A Cost Analysis of the Use of Modified HEART Score to Determine Early Discharge for Possible ACS Patients Presenting to the Emergency Department

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Background: The evaluations of the 8 to10 million patients who annually present with possible acute coronary syndrome (ACS) to the Emergency Department (ED) in the United States is time-consuming and costly. The Modified HEART Score (MHS) stratifies suspicion for ACS based on the **H**istory, **E**CG and the **A**ge and **R**isk fac**T**ors in patients with serial negative cardiac troponin (cTn) values. A MHS ≤ 3 identifies low risk possible ACS patients who may be safe for early discharge from the ED without further observation/cardiac testing.

Objectives: To determine the effect on hospital length of stay and total and stress testing costs at 30 days for patients with a MHS ≤ 3 randomized to observation/cardiac stress testing or early ED discharge.

Methods: This was a prospective, randomized controlled trial enrolling adult patients who presented to the ED with symptoms of possible ACS, had 2 cTn values < 0.04 ng/ml, and the ED physician decided required further observation/cardiac stress testing. Informed consent was obtained and patients were randomized to receive observation/stress testing or early discharge.

Results: There were 105 patients enrolled. The mean hospital length of stay, total costs and the cost of stress testing were significantly decreased in patients with a MHS ≤ 3 who received early ED discharge without further cardiac evaluations as compared to those receiving observation/stress testing (Figure). There were no deaths, non-fatal MIs, hospitalizations, or coronary revascularizations in the 103 of 105 patients who had 30-day follow-up. Three patients randomized to early discharge had stress testing within 30 days but none led to coronary revascularization.

Conclusion: Early discharge without observation/stress testing for ED patients with possible ACS classified as low risk by a MHS ≤ 3 and with normal serial cTn values can substantially reduce the length of stay and costs of care for these patients. Such a decision aid, if further validated for safety and implemented nationally, could save billions of dollars annually.

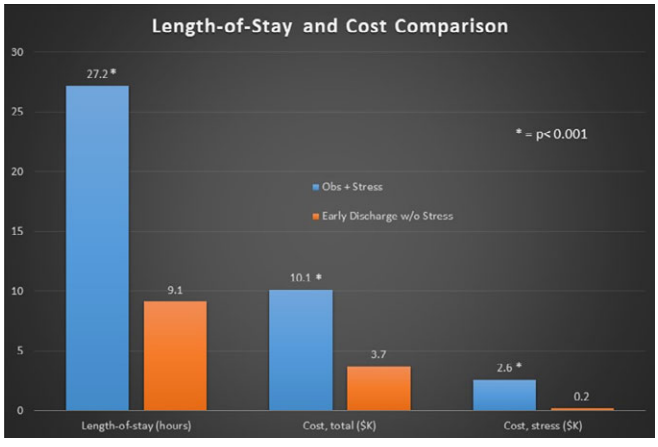

Figure 479 – Nowak

480 Validation of the HEART Score in an Urban Mid-Atlantic Emergency Department

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Background: The History, EKG, Age, Risk factors and Troponin (HEART) score has been validated as a predictor of Major Adverse Cardiac Event (MACE) in Emergency Department (ED) patients with chest pain. Fewer studies have looked at the validity of the HEART Score in the United States.

Objectives: Our objective was to assess the HEART score's ability to predict MACE in a large inner city Mid-Atlantic ED.

Methods: Retrospective chart review of a Mid-Atlantic ED with a yearly census of 90,000 patients. Data, including demographics, HEART score, outcome of admission and 30 day MACE as described by Backus et. al, were abstracted by the authors, with EKGs being graded by consensus between three physicians. HEART Scores were categorized as low (0-3), intermediate (4-6) and high risk (7-10). Chi-square testing was used to compare proportions and a t-test was used to compare means.

Results: Of 771 patients admitted from our ED in 2014 with chest pain, 83% were African-American and 55% were female. Overall, there

were 37 coronary revascularizations, 12 coronary catheterizations revealing procedurally correctable stenosis managed conservatively, 8 acute myocardial infarctions and 1 death. Patients with HEART score ≤3 (low risk, 31%) had a MACE rate of 2% (5/232). This contrasts with an 8% (36/472; p<0.01) incidence of MACE in the 61% of patients that were intermediate-risk and a 25% (17/69; p<0.01) incidence of MACE in the high-risk group (9% of patients). Patients with MACE had mean HEART scores of 5.4 (SD 1.5) compared to 4.3 (SD 1.6) in non-MACE patients (p<0.01).

Conclusion: Use of the HEART score in an inner-city urban ED population identified a low-risk group of patients that could have pursued outpatient cardiac testing. The ≤2% miss rate for MACE in the low risk group is consistent with prior studies.

481 The Impact of the HEART Score on Outpatient Advanced Cardiac Testing at University of New Mexico Hospital

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Background: In an effort to standardize the approach for evaluating patients presenting with chest pain (CP) but without evidence of ACS, we implemented a CP Algorithm using the HEART Score in October 2013. Providers were asked to record the HEART Score, admit patients to ED Observation Unit with scores > 3 for Advanced Cardiac Testing (ACT), and to discharge patients with scores ≤ 3 for outpatient ACT.

Objectives: Objectives were to assess provider compliance with the algorithm, the impact on outpatient ACT utilization, differences in patient characteristics between periods, and risk factors associated with patient non-compliance for outpatient ACT. Our primary hypothesis is that the use of a standardized CP Algorithm will increase outpatient ACT in patients with similar characteristics without increasing adverse events.

Methods: We conducted a pre and post retrospective chart review of all patients presenting to our ED with chest pain who were discharged and scheduled for outpatient ACT. Period 1 of the study was from Dec 2012 to May 2013, Period 2 from Dec 2013 to May 2014. We recorded total numbers of patients, age, gender, ethnicity, language, type of insurance, initial ECG findings. We also recorded any 30-day death or adverse cardiac event. Results were compared using Chi-square, Fischer's exact test and logistic regression.

Results: 343 patients in Period 1 and 394 patients in Period 2 were discharged and scheduled for outpatient ACT, an overall increase in 14.5% after CP algorithm implementation. See table for patient characteristics. Provider compliance was good with the HEART score recorded for 315 patients (80%) in Period 2, and for those undergoing outpatient ACT, 93% had a score ≤ 3. Patient compliance for outpatient study decreased from 62% to 44% (p<.05) between periods. At 30 days no deaths were recorded for both study periods, although re-admission occurred 2% of the time, the majority based of positive outpatient ACT results. Age, sex, insurance status, language, ethnicity were not associated with risk factors for patient non-compliance.

Conclusion: There was a 14.5% increase in outpatient ACTs in similar patient populations after implementation of a CP Algorithm. Provider compliance was good although patient compliance was poor without identifiable risk factors for non-compliance.

Patient Demographics and Characteristics

	Pre-Implementation (343)	Post-Implementation (394)	Combined (737)
Age (yrs)	51 (46-58)	53 (47-57)	52 (46-58)
Female Gender (%)	40%	44%	42%
English Primary Language (%)	86%	74%	80%
Insurance Status (%)			
Private	22%	14%	18%
Medicare/ Medicaid	50%	38%	44%
Self Pay	18%	26%	22%
History of known CAD (%)	2%	6%	4%
Normal ECG findings (%)	88%	80%	83%

Table 481: Seidenberg.

482 HEART Score Stratification by Coronary CT Angiography

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Background: In non-acute coronary syndrome patients, risk stratification of potential coronary atherosclerotic disease is essential for appropriate disposition. The HEART score is becoming an accepted risk stratification and disposition tool. A higher HEART score correlates with a higher risk of major adverse cardiac events (MACE), within 6 weeks of assessment. Cardiac computed tomography angiography (CCTA) is an increasingly utilized diagnostic tool to determine if there is significant coronary artery disease in low risk patients. It is unknown how HEART scores stratify coronary artery stenosis severity.

Objectives: To stratify HEART scores against the degree of coronary artery stenosis as determined by CCTA in low risk chest pain patients, and to determine if a HEART score < 3 (considered low risk - MACE of 0.9-1.7%) reliably predicts the absence of clinically significant coronary artery disease as determined by CCTA.

Methods: A retrospective chart review was performed at the University of Florida in Gainesville, FL. Data were abstracted from the EMRs of patients presenting over a 35-month period (2010-2013). All ED patients presenting with symptoms concerning for acute coronary syndrome (ACS), who were deemed low risk by physician discretion and who had a CCTA performed were included in the analysis. CCTA results were graded by independent, board certified teams of cardiologists and radiologists as no stenosis, non-significant stenosis, and significant stenosis. Patients' HEART scores were calculated and compared with CCTA results.

Results: 288 patient records were reviewed: 59% were female, and the average age was 47. HEART scores ranged from 1 to 5 with 93% having a Heart Score of 3 or less. 7.9% of individuals considered low risk by clinical gestalt were found to have significant stenosis. 6.9% of patients considered low risk by the HEART Score were found to have significant stenosis, with 10% of individuals with a Heart Score of 3 having significant stenosis.

Conclusion: Risk stratification by clinical gestalt revealed a large number of patients with HEART scores greater than three and significant stenosis by CCTA. A sizeable number of patients with HEART scores of 3 or less had significant stenosis by CCTA.

	CACT Stenosis						
HEART Score	None		Non-Significant		Significant		Patients per HEART score
0	0	0.00%	0	0.00%	0	0.00%	0
1	23	44.23%	26	50.00%	3	5.77%	52
2	43	39.45%	60	55.05%	6	5.50%	109
3	52	49.06%	43	40.57%	11	10.38%	106
4	11	57.89%	5	26.32%	3	15.79%	19
5	1	50.00%	1	50.00%	0	0.00%	2
Total	130	45.14%	135	46.88%	23	7.99%	288

Table 482: Beattie.

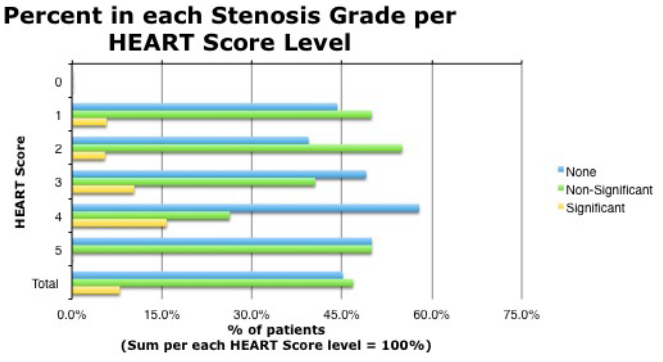

Figure 482 – Beattie

483 The HEART Score and Emergency Department Chest Pain Observation Unit Admissions

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Objectives: To assess whether application of the HEART score to a previously admitted cohort of chest pain observation unit (EDOU) patients would identify a cohort at low enough risk that expedited Emergency Department (ED) discharge would be equally safe while reducing EDOU admissions.

Methods: A retrospective observational chart review was conducted of patients admitted to our EDOU. This seven-bed unit is overseen by ED staff including an ED physician and an advanced practice provider. All admitted patients undergo a 6-hour protocol that includes serial electrocardiograms (ECGs), serial biomarkers, and continuous telemetry. Upon completion of the protocol, all patients are seen by a cardiologist and follow-up is conducted at 30 days to assess the rate of acute coronary syndrome (ACS) and major adverse cardiac events (MACE). This is a low-risk cohort at a large, academic ED with a previously demonstrated ACS rate of 2.1% and 30-d MACE rate of 0.2%. Trained chart abstractors, blinded to outcomes, utilized the collected data to calculate HEART scores for every patient. Low-risk patients were considered those with a HEART score of ≤3. The primary outcome was 30-d MACE not significantly different from the historical 30-d MACE rate. The secondary outcome was the percentage of patients identified for early discharge by a HEART score ≤3. Preliminary power analysis estimated a sample size of 1700 patients with a HEART score ≤3 would supply >90% power to detect a MACE <1%.

Results: Of the 2300 patients, 2.1% had ACS and 0.2% [95% CI 0.2-0.8] had 30-d MACE. Risk-stratification by a HEART score identified 919 patients for early discharge, 40% [95% CI 38-42] of the patients reviewed. None of the low-risk cohort experienced a MACE, one patient had ACS following a positive stress test [95% CI 0-0.3%]. Expedited ED discharge of patients with a HEART≤3 would not have led to an increase in 30-d MACE (p=0.17).

Conclusion: Utilizing the HEART score to risk-stratify low-risk patients with chest pain would substantially reduce the number of patients admitted to an ED observation unit without any significant increase in major adverse cardiovascular events.

484 Sex-Related Differences in High-Sensitivity Troponin Levels in Patients Undergoing Exercise Stress Testing

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Background: Previous work has shown that high sensitivity troponin T (hsTNT) levels may rise in the setting of exercise, and that, at rest, men have higher baseline hsTNT levels than women.

Objectives: We hypothesized that among ED observation unit patients undergoing stress testing, men would have higher baseline hsTnT levels and greater dynamic response in hsTnT levels to exercise stress testing than women.

Methods: We prospectively collected clinical data and blood samples from consecutively enrolled patients who were placed in an urban academic ED-based observation unit and received exercise stress echocardiography testing. Plasma hsTNT concentrations (Roche Diagnostics) were determined at baseline (pre-stress test), 2 hours post-stress test and, when possible, 4 hours post-stress. Stress tests were interpreted by board certified cardiologists blinded to biomarker results. Changes between baseline and post-stress ("stress-delta") hsTnT levels were calculated and compared between sexes using nonparametric statistics (Wilcoxon test) due to skew.

Results: We enrolled 329 patients, 152 men and 177 women. The median age was 51 (IQR 44, 60) years; 37.4% were African American. Twenty-seven patients (8.2%) had evidence of ischemia during stress tests with a similar proportion of men versus women. The median baseline, 2-hour, 4-hour, and absolute stress-delta hsTnT values are shown in Table 1. In simple comparisons, men had higher hsTNT levels at all timepoints compared to women. After controlling for baseline levels, there were higher 2-hour post-stress levels in men, but no significant differences in 4-hour values. Neither sex had significant stress-delta changes.

Conclusion: Men had significantly higher baseline, 2 hour and 4 hour post-stress hsTnT levels than women. There was no evidence of change in hsTnT values in response to exercise stress testing (stress-delta changes), in either sex.High-sensitivity Troponin T Results in Response to Exercise Stress Testing by Sex

Table 1. High-sensitivity Troponin T Results in Response to Exercise Stress Testing by Sex

Characteristic	Men (N=152)	Women (N=177)	P-value from Wilcoxon test
Ischemia on Stress Test	12 (7.9%)	15 (8.5%)	
Baseline hs-Troponin (Median), (25th, 75th) ng/L	5.6 (<3, 9.2)	<3 (<3, 4.9)	<0.0001
2 hour Post-Stress hs-Troponin (Median) (25th, 75th) ng/L	6.6 (3.5, 10.1)	<3 (<3, 6.8)	<0.0001
Absolute 2 hour Stress Delta hs-Troponin (Median) (25th, 75th) ng/L	0.6 (-0.1, 2.6)	<3 (<3, 1.8)	0.1984
4 hour Post-Stress hs-Troponin (N)	80	94	
Median (25th, 75th) ng/L	8.0 (4.5, 13.3)	4.9 (<3, 9.0)	0.0004
Absolute 4 hour Stress Delta hs-Troponin (Median) (25th, 75th) ng/L	0.9 (-0.2, 4.1)	0.4 (<3, 4.9)	0.7137

Table 484: Limkakeng.

485 Optimal Arterial Blood O_2 and CO_2 Tensions in the Early Post-Resuscitation Phase for Cardiac Arrest Patients Receiving Extracorporeal Cardiopulmonary Resuscitation

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Background: Increasing evidence suggests that optimal arterial blood O_2(PaO_2) and CO_2 tensions ($PaCO_2$) in the early post-resuscitation phase are crucial for patients' survival and neurological outcomes following cardiac arrest and CPR. There are, however, a paucity of data concerning optimal PaO_2 and $PaCO_2$ in patients receiving extracorporeal membrane oxygenation (ECMO) support.

Objectives: To determine the optimal PaO_2 and $PaCO_2$ early after CPR in patients under ECMO support.

Methods: A retrospective analysis was conducted in a prospective series enrolling non-traumatic cardiac arrest patients receiving ECMO during and after CPR (Jan. 2000 - Dec. 2013). The PaO_2 and $PaCO_2$ of the first arterial blood sample upon admission to ICU were analyzed in correlation to survival and neurological outcomes. A generalized additive model (GAM) plot was adopted for verifying the effects of PaO_2 and $PaCO_2$ on survival and favorable neurological outcome. The two variables were then dichotomized according to the optimal range. Univariate analysis was done to determine relevant resuscitation factors associated with survival and neurological outcomes. Candidate variables were then entered for multivariate analysis using stepwise procedure.

Results: Of the 375 patients included, 131 (34.9%) survived to hospital discharge while 124 (33.1%) had favorable neurological outcomes. GAM plots verifying the effects of PaO_2 and $PaCO_2$ on the logit(P) of survival and favorable neurological outcome identified the optimal range of PaO_2 to be 55-225 mmHg and that of $PaCO_2$ to be % gt; 36 mmHg. In multiple logistic regression analysis, age (OR 0.98, 95% CI 0.97-0.99), initial cardiac rhythm of VT/VF (OR 2.68, 95% CI 1.67-4.29), PaO_2 55-225 mmHg (OR 2.08, 95% CI 1.27-3.40) and $PaCO_2$ >36 mmHg (OR 2.10, 95 CI 1.17-3.77) were associated with survival to hospital discharge. For neurological prognosis, initial rhythm, (OR 2.84, 95% CI 1.75-4.61), epinephrine dose (OR 0.96, 95% CI 0.94-0.99), PaO_2 of 55-225 mmHg (OR 2.72, 95% CI 1.65-4.51) and $PaCO_2$ > 36 mmHg (OR 2.07, 95% CI 1.15-3.75) were associated with favorable neurological outcome.

Conclusion: PaO_2 of 55-225 mmHg and $PaCO_2$ > 36 mmHg independently predict survival to hospital discharge and favorable neurological outcome in patients receiving ECMO CPR. Judicious titration is suggested in post-cardiac arrest care.

486 The Use of Regional Cerebral Oxygen and Tissue Oxygenation Monitoring During and Immediately after Cardiac Arrest in the Emergency Department

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Background: Regional cerebral oxygen saturation (rSO2) and peripheral tissue oxygen monitoring (StO2) via near-infrared spectrometry are promising modalities to improve resuscitation management. The relationship of this information to the return of spontaneous circulation (ROSC) and patient outcome remain unclear.

Objectives: To determine rSO2 and StO2 values of subjects in active or recent CA between those who survive to hospital admission and those who do not.

Methods: This is an ongoing prospective cohort of adult patients presenting to the Emergency Department (ED) of an urban Level 1 Trauma Center in active or immediately post CA. Study enrollment began in October 2015. Upon enrollment, trained Research Associates (RAs) placed an rSO2 probe on the subject's left forehead and collected data on rSO2 and StO2 values, vital signs, medications given, or interventions performed in the ED, information regarding the arrest, and medical history of the subject. Chart review was also performed to determine subject outcomes.

Results: To date, 12 subjects have been enrolled (median age 60.5 (range 39-81), 58% male. PEA was the initial rhythm in 7 subjects (58%), with 3 (25%) in asystole, and 2 with VF/VT (17%). In 5 subjects, ROSC was obtained pre-hospital. In an additional 2 subjects, ROSC was obtained in the ED, for a total of 7 subjects surviving to hospital admission (58%). The median rSO2 baseline value in the ED of those with pre-hospital ROSC was 71% (34-84). The median rSO2 baseline values of those in CA with eventual ROSC obtained in the ED was 49% (36-62). In subjects (n=7) who survived to hospital admission, the median rSO2 value at discharge from the ED was 69% (51-89). Of those subjects who did not survive (n=5), the median baseline rSO2 was 15% (15-20) and at time of death the median was 15% (15-47). The median StO2 value of those surviving to hospital admission was 77% (8-92) compared to a median of 26% (7-39) in those who did not.

Conclusion: In active CA and during the peri-arrest period, rSO2 and StO2 monitoring in the ED are feasible and allow detection in real-time of changes in brain and peripheral tissue oxygenation. Based on these findings, further research to determine their accuracy in predicting outcome and utility in guiding resuscitation is indicated.

487 Building Sustainable Screening, Brief Intervention, and Referral to Treatment Within Emergency Departments in an Integrated Hospital System in New York: An Implementation Model

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Background: Screening, Brief Intervention, and Referral to Treatment (SBIRT) for substance use has received a great deal of empirical support. Despite the strong evidence for effectiveness, and a compelling rationale for its integration, the circumstances under which it is likely to be implemented and sustained remains elusive. In the project NYSBIRT-II, SBIRT was implemented into EDs affected by Hurricane Sandy within a large integrated health system in the New York metropolitan area.

Objectives: To describe the innovative implementation of SBIRT, and our results for the first 22-months.

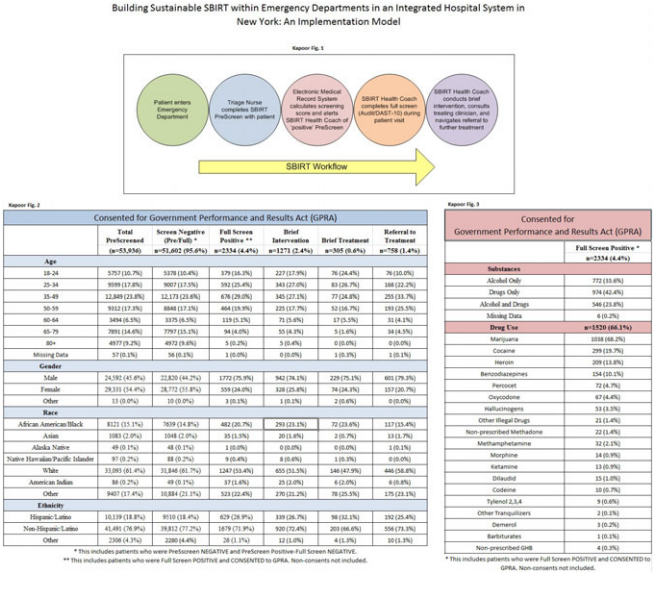

Figure 487 – Kapoor

Methods: The SBIRT model was implemented in the following way: 1) front line staff administers a 5-question SBIRT Pre-Screen for alcohol, drug, and tobacco use to all patients during triage; 2) A health coach (HC) conducts a full screen using the AUDIT and/or DAST-10 for positive prescreens; 3) the HC conducts a brief intervention and referral to treatment as indicated by the full screen score (see Fig. 1). In order to assist with integration into the workflow, prescreening questions were programmed into the Electronic Medical Record (EMR) systems. The EMR automatically scores the prescreen and flags the chart for positive screens.

Results: Implementation has occurred in four EDs starting December 2013. Initial implementation was evaluated using GPRA data (see Fig. 2). To date, 53,936 patients were prescreened with a 12.3% positive rate. The patients were diverse, with more women than men pre-screened (54.4% female); Age: 35-49 (23.8%), 25-34 (17.8%), ≥50 (47.7%); Ethnicity: Latino (18.8%); Race: Caucasian (61.4%), African American (15.1%). 4,175 full screens were conducted with a 59.9% positive rate, resulting in 2,334 brief interventions with 1,063 patients eligible for referrals to brief or formal addiction treatment. A significant percentage (23.7%) were positive on both the AUDIT and the DAST-10, with marijuana, cocaine and heroin as the most commonly used drugs (see Fig. 3).

Conclusion: SBIRT services in a large, integrated health system are needed, and can be successfully implemented. Further research will assist in making SBIRT universally sustainable in the ED setting.

488 The Effect of Triage Chief Complaints on Emergency Department Room to Provider Time in a Community Tertiary Care Hospital

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Background: Anecdotally, emergency providers have preferences for evaluating certain chief complaints (CC) over others, whether it is due to its effect on timely disposition or complexity of work-up.

Objectives: The goal of this study was to determine if there is an association between emergency department (ED) room to provider waiting times and CC.

Methods: A retrospective cohort study was conducted at a single tertiary care community ED. All adults (>17), who were triaged to a Lean Track area of the ED for a 6-month period were included. Each presenting CC was sorted into a category, and those with less than 50 patients were excluded, leaving 34 CC categories. A total of 10,830 patients were used for analysis. Using median room to provider times, the relationships between waiting time and age, gender, and involvement of a physician's assistant (PA) were measured using Spearman's correlation, Wilcoxon Sum Rank, and Kruskal-Wallis tests. The impact of each CC on time to provider was evaluated and quantified using multiple linear regression.

Results: The CC with the largest positive impact on time to provider is hypertension, with an increase of 5.39 minutes ($p=0.003$). This is followed by neurological, with an increase of 4.10 minutes ($p=0.004$), weakness, with an increase of 3.90 minutes ($p=0.02$), and headache, with an increase of 3.73 minutes ($p<0.001$). The CC with the largest negative impact on time is male genitourinary, with a decrease of 4.68 minutes ($p=0.004$). This is followed by dental, with a decrease of 3.54 minutes ($p<0.001$), ear, with a decrease of 3.47 minutes ($p=0.02$), trauma, with a decrease of 3.21 minutes ($p<0.001$), and musculoskeletal, with a decrease of 3.20 minutes ($p<0.001$). The waiting time for males is less than females ($p<0.001$). Patients are seen earlier when seen by a PA ($p<0.001$), and younger patients are seen sooner than older patients ($p=0.001$).

Conclusion: Some CC have significant impacts on room to provider waiting times. Although, we cannot infer the severity or complexity of work-up of certain CC, patients with seemingly less severe CC or easier dispositions such as dental or ear, are being evaluated sooner than patients with presumably more complex CC, such as neurological or weakness. Further research is needed to determine the cause of these differences in time to provider.

489 How Much to Buy Down Your Throughput?

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Background: Beginning in 2013, hospitals began reporting ED related throughput metrics to the Centers of Medicare and Medicaid Services (CMS). History indicates that these metrics will be used to encourage hospitals to improve their metrics by withholding reimbursement. Placing a physician-in-triage (PITDOC) to rapidly assess patients as they hit the door has had mixed results in improving these parameters. Furthermore, the financial considerations of PITDOC have not been previously described.

Objectives: Our objectives were to describe the gross physician cost (GPC) of adding a PITDOC and calculate the difference in six key ED throughput metrics.

Methods: At our 90,000 ED visit community hospital, we conducted a before and after trial of adding a PITDOC between 6pm - 10pm. The before cohort represented a historical control from September 21st to October 4th, 2015, while the after cohort represented the same time period between October 5th - October 17th, 2015. The investment to provide four hours of additional physician coverage per day was $722.42. Our primary outcomes were to quantify the GPC to address ED throughput metrics and then provide this value on a per patient basis. Our secondary outcomes were to report differences in: 1) Door-to-Doc, 2) Door-to-Room, 3) Door-to-Admit 4) Door-to-Discharge, 5) Left without Being Seen, and 6) ED Length-of-Stay (EDLOS). The data were analyzed using descriptive statistics, t-test for significance and confidence intervals were reported using the modified Wald method.

Results: During the study a total of 937 patients comprised the before cohort while 794 patients were in the after cohort. All primary outcomes are reported in Table 1. The mean Door-to-Doc and Door-to-Room times improved significantly resulting in a decreased EDLOS of 59.19 +/- 25.99 minutes between cohorts. This decrease in EDLOS resulted in 783.33 additional ED bed hours available during the study period with GPC of $5.00 per patient.

Conclusion: In our community hospital setting, a physician-in-triage can significantly reduce ED Length-of-Stay by improving front-end metrics at a cost of $5.00 per patient.

ED Throughput Metrics

	Before Cohort	After Cohort	Significance
Door-to-Doc (min)	56.12	16.68	$p < 0.0001$
Door-to-Room	51.89	46.67	$p = 0.0133$
Door-to-Admit (min)	194.8	193.25	N.S.
Door-to-Discharge (min)	172.9	170.14	N.S.
EDLOS (min)	299.8	240.61	$p < 0.0001$
Left Without Being Seen (#)	15	10	N.S.

Table 489: Anderson.

490 Evaluation of a Novel Web-Based Electronic Sign Out Process for ED to Inpatient Admission in the Community Setting

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Background: Previous studies in the tertiary care setting have shown that a standardized physician electronic sign-out ("eSignout") process is both efficient and safe for ED to inpatient admission. It is currently unknown whether this strategy can be applied in the community hospital setting with similar results.

Objectives: To evaluate the efficiency and safety of a physician eSignout process at a community hospital, measured by ED length of stay (LOS) and quality assurance (QA) events.

Methods: This is a retrospective, interventional study at a 41-bed community hospital with approximately 15,000 annual ED visits. The study period was April to August 2014 (pre-implementation) and April to August 2015 (post-implementation). We compared ED LOS and QA events in the pre- and post-implementation periods among admitted patients. We calculated 95% confidence intervals and compared the means using a t-test with two-sided alpha set at 0.05. The significance of QA events was assessed using a Fisher's exact test.

Results: In the pre-implementation phase, 1,041 patients were admitted to the hospital with a mean ED LOS of 333.5 minutes (95% CI: 322.2 - 344.8) as compared to a total of 1,106 patients with mean ED LOS of 338.9 minutes (95% CI: 327.4 - 350.4) in the post-implementation phase (p = 0.51). QA events were identified in 1.2% (13/1,041) of the pre-implementation group and 0.45% (5/1106) of the post-implementation group (p = 0.056).

Conclusion: Implementation of a physician eSignout in a community hospital does not appear to hinder efficiency or safety of the ED to inpatient admission process. There was a trend toward decreased QA events with use of the standardized eSignout, although it did not reach statistical significance. This may be a useful tool to improve clinical operations in the community setting, and warrants further study.

491 Characteristics of Patients Admitted to the Hospital Within 72 Hours of Discharge from the ED

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Background: ED returns within 72 hours of discharge serve as a quality indicator. Several studies have investigated factors associated with ED returns and concluded that repeat ED visits are rarely due to missed diagnosis or inappropriate care. However, few have examined the subset of patients who require admission to the hospital upon repeat visit. This subset may represent cases of suboptimal ED care.

Objectives: To identify characteristics of adult patients who return to the ED and require admission after ED discharge. We hypothesized that patients who were readmitted after their initial ED visit would have indications of greater complexity and fragmentation of care as shown by increased consultations and hand-offs.

Methods: We collected and analyzed nested case control data from our academic center ED patients with two visits within 72 hours over a 12-month period. We defined cases as all patients admitted at repeat visit and compared them to a sample of controls (those not admitted at repeat visit). We selected one control per case, with controls selected as the next sequential patient with an unscheduled 72-hour return ED visit not requiring admission. We descriptively analyzed patient demographics, illness factors, and provider related factors at the initial visit. We used OR and CI to assess association and statistical significance.

Results: We had 2136 patients who had a 72-hour return visit. There were 258 (12%) patients admitted at the second visit (cases). For both groups, vital signs at triage and discharge were similar, suggesting an overall similar illness severity. Cases were older (median age 49 vs 46 years, p=0.01) and more likely to be female (42% vs 32%, OR: 1.54, CI: 1.08-2.21) than controls. Visit #1 triage acuity was higher in cases. Patients with cardiac, respiratory, neurological, renal, and diabetic disease occurred more frequently in the case group. Cases were more likely than controls to have had a consultant involved in their care at visit #1 (23% vs 16%, OR: 1.62, CI: 1.04-2.52) and were also more likely to have been handed off at least once by the original ED team at the initial visit (28% vs 13%, OR: 2.55, CI: 1.62-4.00).

Conclusion: Consultant involvement and ED provider hand-offs indicate increased patient complexity and higher likelihood of admission at a 72-hour return visit. Providers should consider appropriateness for discharge in this subgroup.

492 The Emergency Department (ED) Admit Request: Conversion Percentage and Time to Acceptance

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Background: At many university teaching hospitals, emergency physicians (EPs) do not have direct admitting privileges. Instead, they must request admission to an inpatient service (represented at this institution by a 'Pre-Admit' electronic order) and await the evaluation and ultimate acceptance (or discharge) by that team. It is only then that a search begins for an appropriate inpatient bed. This can have significant impact on patient throughput and ED length of stay.

Objectives: To study the effects of an admit process which requires a pre-admission evaluation by a medicine service representative in the ED prior to acceptance to that service.

Methods: Observational retrospective review of all ED patient encounters in a four month period in which a medicine service or medicine subspecialty was consulted to admit a patient. This encounter data was analyzed from the hospital EMR and the time intervals of patient flow events were calculated. The rate of admission was then calculated for this cohort, as was the mean and median time to acceptance (i.e.inpatient team consultation to formal acceptance/admission).

Results: A total of 2,345 patient encounters were included in this study, comprised of 1318 (56%) general medicine, 388 (17%) digestive health, 304 (13%) cardiology, 199 (8%) oncology, and 136 (6%) hospitalist patients. The overall rate of admission to the hospital (to any primary service) for this cohort following the consulting service evaluation was 94.5% (2216 of 2345). The median length of time between admitting team consultation and acceptance of patient was 76.0 minutes, with a mean time of 92.8 minutes. A total of 40.4% of patients waited over 90 minutes for admission after consultation was placed.

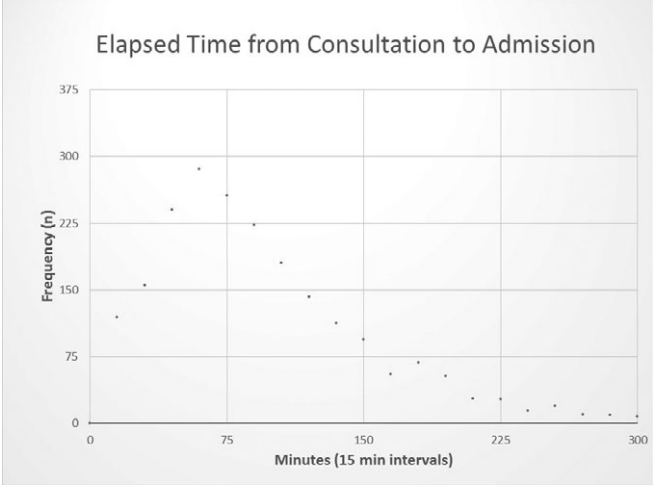

Figure 492 – Nevel

Rate of conversion from consultation ('Pre-Admit') to acceptance by service	
Consulting Service	Admission Rate
Cardiology	94.4%
General Medicine	94.2%
Digestive Health	96.1%
Hematology-Oncology	93.4%
Hospitalist	94.1%
Overall	94.5%

Table 492: Nevel.

Conclusion: During the study time period at this academic medical center, the rate of admission for patients undergoing a pre-admission evaluation by a medicine service representative was 94.5%. The average time between consultation and acceptance (and thus inpatient bed search) was 92.8 minutes.

493 Predictors of Inappropriate Length of Stay and Admission from Observation in a Clinical Decision Unit

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Background: Current research proposes an optimal Clinical Decision Unit (CDU) length of stay (LOS) of 8 to 24 hours and a 20% rate of admission from observation. Exceeding benchmarks results in misappropriation of resources and loss of reimbursement. Identifying variables associated with inappropriate LOS and admission will aid patient selection for observation.

Objectives: To identify variables associated with LOS more appropriate for the main ED (<8 hours), LOS more appropriate for admission (>24 hours), and inpatient admission irrespective of LOS. Variables such as age, gender, and type of diagnostic testing were tested for correlation with inappropriate LOS or admission.

Methods: This is a retrospective chart review of patients admitted to a 12-bed CDU from 8/22/2011-12/28/2013 at an urban ED. Subjects who left against medical advice or returned to the main ED were excluded from the analysis. Predictive variables included age (<65, ≥65), gender, and type of diagnostic testing (no tests; cardiac tests such as stress or echo; non-cardiac tests such as ultrasound, CT, MRI). Multinomial logistic regression was used to model LOS (categorized as <8 hours, 8-24 hours, and >24 hours) and admission as a function of each variable. Odds ratios (OR) and 95% confidence intervals were calculated.

Results: 9,162 patients were included in the primary analysis, and of these, 9,070 met the inclusion criteria. None of the variables strongly predicted LOS <8 hours. Cardiac diagnostic testing and non-cardiac diagnostic testing were associated with LOS>24 hours (OR 1.83, 95%Cl 1.62-2.07; OR 1.50, 95%Cl 1.28-1.76 respectively). Cardiac diagnostic testing was not associated with admission (OR 0.43, 95%Cl 0.35-0.52) while non-cardiac diagnostic testing, (OR 1.46, 95%Cl 1.23-1.72) age, (OR 1.22, 95%Cl 1.06 1.41) and male gender (OR 1.25, 95%Cl 1.10-1.43) respectively, were associated with admission.

Conclusion: The need for diagnostic testing is correlated with LOS >24 hours. Dedicated resources and imaging for the observation unit may reduce such LOS. Age, gender, and non-cardiac diagnostic testing are correlated with admission from observation. Compared to cardiac workups, non cardiac diagnostic testing often lacks a set plan and triggers admission. Non-cardiac observation protocols may reduce admissions.

494 Racial and Socioeconomic Disparities in Emergency Department Care of Patients Presenting with Chest Pain

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Background: There is a high prevalence of coronary artery disease (CAD) in racial minorities in the US[1].Decreasing waiting times (WT) and rapid ECG has become a priority in patients presenting with chest pain. A previous study has shown no improvement in WT for African Americans with chest pain.[2] Disparities in WT and treatment of CAD based on gender, ethnicity and income level have also been shown.[3-5]

Objectives: To describe differences in WT, ECG and other evaluations between patients of different ethnic and socioeconomic status.

Methods: We performed data analysis of the 2009 and 2010 National Hospital Ambulatory Medical Care Survey Emergency Department component. We looked at all patients 24 and older who presented to the ED with complaints of chest pain. (CP) We used Reason For Visit codes: "chest pain", chest soreness", "chest discomfort", "chest burning", "heart pain" and "angina pectoris". Descriptive statistics of the chest pain cohort included distribution of age, race, gender, insurance/ payor method, presence of congestive heart failure, diabetes, method of arrival and triage ESI level. Multi and Univariable regression was used to demonstrate if race, ethnicity, or payor type is a primary predictor of EKG ordering and WT.

Results: There were 2679 observations that met the inclusion criteria representing 11,027,525 ED visits with CP. The CP cohort was 51.5% Female, 68.4% White,17.8% Black, 11% Hispanic, 35.9% had Private Insurance, 31.6% Medicare,15.8%Medicaid and 12% were uninsured. The majority of those were triaged at ESI level 1,2, or 3: 86% Emergent or Urgent and 1.9% Immediate. Few patients had CHF 8% or DM 16.6%. The mean waiting time for the cohort was 47.9 minutes 95%CI (40.73 to 55.06). Using logistic regression modeling, the following variables were associated with higher wait time (Beta coefficient [95% CI]): Medicaid (19.13 [0.89-37.37]) and ambulatory arrival (12.31 [2.88-21.75]). Race/ethnicity was not significantly associated with WT in our final model.

Conclusion: Patients with Medicaid continue to wait longer to be seen by a clinician than their privately insured counterparts when they present to the ED with complaints of chest pain. This may represent a disparity associated with economic status.

495 Geriatric Inpatient Admission for Chest Pain and Potential Impact of the Emergency Department Observation Unit

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Background: Geriatric inpatient admission rates from the emergency department (ED) are higher than that of the general ED population.

Objectives: Given increasing pressure to conserve hospital inpatient resources, we analyzed the potential reduction in inpatient admissions by evaluating geriatric patients with chest pain in the EDOU.

Methods: We performed a prospective, observational study of ED patients with chest pain at an urban, academic medical center. Our EDOU does not exclude geriatric patients, and patients are placed in the EDOU for further evaluation of chest pain at the discretion of the attending emergency physician. We collected baseline data on patients as well as outcomes related to the ED and EDOU stays. The primary study outcome was the number of geriatric patients evaluated in the EDOU and the potential reduction in inpatient admission rates through the use of the EDOU for this population.

Results: Over 42 months, 1990 presented to the ED with chest pain and agreed to participate in the study. 19.2% of patients were geriatric (age 65 and older). The overall rate of inpatient admission or EDOU placement was 61.5%. Geriatric patients were more likely to be admitted to an inpatient unit or placed in the EDOU than non-geriatric patients (80.4% vs. 57%, p<0.001). Nearly half (48.9%) of geriatric patients were placed the EDOU rather than admitted to an inpatient unit for the evaluation of chest pain. The geriatric inpatient admission rate from the EDOU was 15.6%, resulting in an overall inpatient admission rate of 47.4% among geriatric patients presenting to the ED with chest pain. Assuming that all geriatric patients placed in the EDOU would have otherwise been admitted to an inpatient unit, the use of the EDOU for geriatric patients with chest pain resulted in a 33% absolute reduction in geriatric inpatient admissions. The absolute reduction in overall inpatient admissions for chest pain was 6.6%.

Conclusion: By employing a protocol that does not exclude geriatric patients, we noted a high rate of EDOU utilization for geriatric patients who may have otherwise been admitted to an inpatient unit for the

evaluation of chest pain. Utilization of an EDOU for this population may result in substantial reductions in geriatric inpatient admissions.

496 Assessing Parents' Knowledge of Child Care and Preschool Disaster Plans

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Background: Children in early learning settings are vulnerable to man-made and natural disasters because of physical and developmental limitations. Little is known about parents' knowledge of disaster preparedness in early learning settings.

Objectives: To examine parents' knowledge of emergency preparedness in their child's early learning settings.

Methods: In May 2015 we conducted a cross-sectional, Internet-based survey of a nationally representative sample of U.S. parents as part of the C.S. Mott Children's Hospital National Poll on Children's Health. Parents of children ages 0-5 years in child care settings or preschools (n=264) were asked about their level of confidence in their center's ability to respond to specific disasters and knowledge of the components of their emergency plans. Multivariate linear regression was used to generate adjusted odds of awareness of specific emergency plans.

Results: Survey participation rate was 55%. Parents reported being "very confident" with their center's ability to deal with: power outage (79%), evacuation (67%), severe weather (62%), delayed parent pick up (60%) and lock-down (58%). Only 21% knew if the plan included all 4 key components of an evacuation plan (child identification, parent identification, rapid communication, extra car seats). 36% of parents reported that emergency plans accommodated children with special needs. Parents who had attended any emergency training events (n=90) were much more likely to be aware of plans for all 5 types of emergency situations (Table 1), compared with parents who had not attended.

Conclusion: Many parents were unaware of emergency plans at their child's early learning settings. Although few parents had attended emergency training events, such participation was associated with higher levels of parental awareness.

497 Pediatric Referrals to An Emergency Department from Urgent Care Centers

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Background: Limited primary care office hours and long emergency department (ED) wait times have fueled the economy for urgent care centers. Non-essential referrals from urgent care centers may contribute to ED inefficiency and overcrowding.

Objectives: The objective of this study is to describe pediatric ED referrals from urgent care centers and to determine the percentage of referrals considered essential.

Methods: A prospective study was conducted between 4/2013 - 4/2015 on patients < 21 years referred directly to an ED in central Pennsylvania from surrounding urgent care centers. Data on demographics and ED presentation, intervention, and disposition were collected and analyzed. Referrals were considered essential based on investigations/procedures performed or medications/consultations received in the ED.

Results: Analysis was performed on 455 patient encounters (mean age 8.7 years), 347 (76%) considered essential. The most common chief complaints were abdominal pain (84 encounters), extremity injury (76), fever (39), cough/cold (29), and head/neck injury (29). 33% of the patients received laboratory diagnostic investigations (74% serum, 56% urine) and 52% radiologic investigations (67% x-ray, 17% CT scan, 13% ultrasound, 11% MRI). 44% of patients received a procedure, the most common being IV placement (66%), reduction, casting, or splinting of extremity fracture/dislocation (18%), and laceration repair (14%). The most common medications administered were IV fluids (20%), oral analgesics (18%), and IV analgesics (15%). No patients in our sample received Pediatric Advanced Life Support procedures or medications. 33% of patients required consultation from a subspecialist (surgical 80%, medical 40%). 83% of patients were discharged home, 13% were hospitalized, and 4% had emergent surgical intervention. The most common primary diagnoses were closed extremity fracture (60 encounters), gastroenteritis (42), brain concussion (28), upper respiratory infection (24), and non-surgical, unspecified abdominal pain (24).

Conclusion: Many ED referrals directed from urgent care centers in our sample were considered essential. Urgent care centers should develop educational and preparedness strategies based on the etiology of emergencies that may occur.

498 Impact of A New Clinical Care Guideline for Acute Gastroenteritis on the Use of Ondansetron in the Pediatric Emergency Department

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Background: The American Academy of Pediatrics recommends oral rehydration therapy (ORT) for the treatment of mild to moderate dehydration caused by acute gastroenteritis (AGE). The use of ondansetron in children presenting with AGE however remains controversial but may decrease overall health care costs.

Objectives: To determine if the incorporation of early ORT into a new clinical care guideline for pediatric patients presenting to the pediatric emergency department (ED) with AGE and mild to moderate dehydration is associated with decreased use of ondansetron.

Methods: This is a retrospective cohort study of children aged 6 months to 18 years diagnosed with vomiting, diarrhea, dehydration and/or AGE in a large, urban, academic pediatric emergency department between February 2012 to August 2012. These data were collected after implementation of clinical care guideline as part of a quality improvement project aimed at increasing the use of ORT for patients with AGE. Data collected included patient demographics, ondansetron use, ORT use, ED length of stay (LOS), and time from triage to ORT. Chi square was used to compare demographic data. Multivariable regressions were performed to identify significant predictors associated with receiving ondansetron and ED LOS.

Results: 1914 patients were included with a median age of 30 months. 44% (838) received ondansetron. 17% (323) of patients received ORT. Factors associated with ondansetron use were ORT (OR 1.92, 95% CI 1.5-2.5), IV placement (OR 2.14, 95% CI 1.5-3.0), inpatient admission (OR 0.47, 95% CI 0.3-0.8) and age over 12 months (OR 2.60, 95% CI 2.0-3.4) but not triage level, day of presentation or gender. In patients who received ORT, age over 12 months (OR 2.3, 95% CI 1.2-4.3) and the initiation of ORT more than 90 minutes after initial ED presentation (OR 2.81, 95% CI 1.6-4.9) were significant for receiving ondansetron. Increased ED LOS was significantly associated with receiving ORT more than 90 minutes after initial ED presentation. ($p<0.0001$)

Conclusion: The early initiation of ORT in patients presenting to the pediatric ED with AGE may decrease ED LOS and decrease the utilization of ondansetron. Further studies to prospectively validate these findings are needed.

499 Inpatient Outcomes and Adequate ED Analgesia in Pediatric Trauma Patients

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Background: Pain management during pediatric multi-system trauma evaluation has been shown to be variable and often inadequate. Outcomes associated with adequate analgesia in children with multisystem trauma has not been fully described.

Objectives: To determine the effects of adequate opioid administration during the multisystem trauma evaluation on inpatient outcomes.

Methods: A chart review was conducted at a level one pediatric trauma center. Charts were analyzed for those who presented for multi-system-traumas between 5/2010 and 5/2012. Patients were excluded if D/C from ED, had surgery, or died. Data abstracted included ED opioid administration, IP opioid administration, ISS, and IP length of stay. Patients were categorized to 1) group A: those who received an adequate weight-based dose of fentanyl, morphine, hydromorphone or oxycodone within 2 hours of the ED visit and 2) group B: those that did not. Inpatient LOS was analyzed using linear regression, and the cumulative opioid administration during the first 3 days was analyzed for a 95% confidence interval. All analyses were performed controlling for age, gender, sex, and ISS.

Results: A total of 334 patients were analyzed. The mean age was 12.5 years and 39% were female. Median ISS score was 5 with range of 1-75. A total of 176 (52%) received at least 1 dose of opioid in the ED. Of these, 162 received it within the two hours. Of these 162, 97 (29% of total) met the criteria for group A—adequate dose of opioid within the first 2 hours. Group B consisted of the remaining 237 patients. Higher ISS was associated with longer LOS as each 5-point increase in ISS, the stay was extended by 52%. Adjusting for ISS, patients in group A were associated with longer inpatient stays (+65%, $p<0.0001$) and were more likely to receive inpatient opioid (morphine OR: 5.2, 95% CI [2.8, 9.7], fentanyl OR:6.5, 95%CI[1.4,30.4],oxycodone (OR: 4.8, 95% CI [2.2, 10.2]).

Conclusion: Only 1/3 of admitted trauma patients received adequate opioid analgesia in the ED and they were associated with longer IP stay and more IP opioid administration during first 72 hours. The nature of this association is yet to be determined.

500 Improving Patient Flow and Satisfaction in a Pediatric Emergency Department with Direct Bedding

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Background: Decreased wait times and improved communication have been associated with improved patient satisfaction in pediatric emergency departments. Direct bedding processes decrease wait time and improve patient flow. We implemented and improved upon a direct bedding process using quality improvement methodologies.

Objectives: Increase direct-bedded rate from 11.4% to 20% and our overall facility satisfaction rating from the 48th percentile to the 60th percentile within 15 months of implementing our direct bedding efforts.

Methods: We established a project team of physicians, nurses, and physician and nursing leadership. The Model for Improvement was used to drive change. Data was collected using our electronic health record and the National Research Corporation Picker satisfaction surveys from Jan 2014 through Jul 2015. Outcomes for direct-bedded rates, patient flow metrics, and satisfaction ratings were tracked on statistical process control charts.

Results: In the 15 months after implementation of direct bedding, arrival to room and arrival to provider times for patients direct bedded is shorter (5.4 v 28.1, $p<0.0001$ and 31.8 v 51.0, $p<0.0001$) respectively. The direct bedded rate increased from 11.8% to 17.6%, but is inversely related to the patient census, and shown only common cause variation. [figure1] Direct bedded rates in our fast track area are significantly lower (1.4% v 13.1%, $p<0.0001$), but less affected by census. Parent satisfaction over this period increased from the 48th percentile to the 90th percentile.

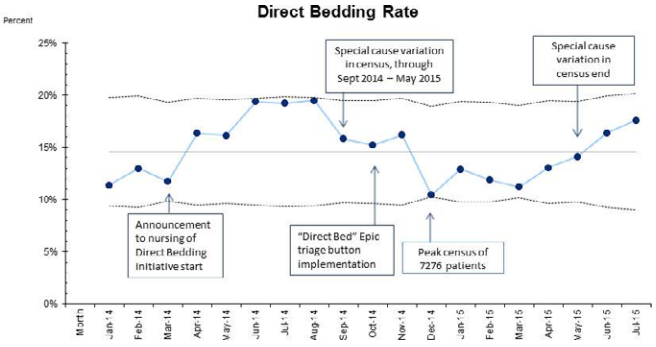

Figure 500 – Kuehnel

Conclusion: This QI project showed direct bedding as a way to decrease wait time and time to be seen by provider, but further ability for improvement may be impacted by census. Future efforts to improve direct-bedded rates will be aimed towards earlier identification and rooming of fast track appropriate patients. In regards to parent satisfaction, continued improvement of patient flow and understanding of what parents value will be further investigated to tailor future quality improvement efforts.

501 A Retrospective Comparison of Critical Procedures Performed for Children in a Combined Adult and Pediatric Level I Trauma Center and a Tertiary Pediatric Emergency Department

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Background: Historically, critical procedures (CPs) performed for children in the emergency department (ED) have included placement of central venous catheters (CVC), intraosseous needles (IO), thoracostomy tubes (TT) and endotracheal intubation (EI). Emergency medicine physicians treat a variety of critically ill pediatric patients, which differ depending on their surrounding patient population and hospital niche.

Objectives: To compare the number, type, frequency and providers of CPs performed for children between a combined adult and pediatrics level I trauma center vs. tertiary pediatric emergency department (GED vs. PED).

Methods: We defined CPs as EI, chest compressions (CC), cardioversion/defibrillation (CV), CVC, IO, and TT. From January 2014 through April 2015, we performed a retrospective chart review of all children, less than 18 years old, admitted from two EDs to their respective pediatric intensive care units (PICU). We identified children for whom CPs were performed in the ED and abstracted data points

Table 1. Critical procedures performed on children during a 16-month period at a combined adult and pediatrics trauma center with a volume of 13,867 patients and a tertiary pediatric emergency department with a volume of 18,277 patients.

Procedure	Combined ED (n=13,867)	Pediatric ED (n=18,277)
Endotracheal intubation	45	18
Chest compressions	0	1
Cardioversion/defibrillation	2	2
Central venous line placement	13	2
Intraosseous placement	7	4
Thoracostomy tube	0	0
Total	67	27

Table 501: Kornas.

including age, gender, diagnosis (medical vs. trauma), CP received, and provider who performed the procedure.

Results: During the study period, 13,867 children presented to the GED and 513 (3.7%) were admitted to the PICU, while 18,277 children presented to the PED with 370 (2.0%) admitted to the PICU. Children who received CPs in the GED vs. PED were mean age 5.3 vs. 2.0 years and male 53% vs. 48%. Trauma was the diagnosis in 214 (41.8%) at the GED vs. 18 (4.8%) in the PED patients. Of the children admitted to the PICU, 57 (11.1%) received at least one procedure in the GED vs. 27 (7.3%) in the PED. Twelve children received more than one procedure in the GED and five in the PED. Trainees performed 94% of CPs in the GED vs. 56% in the PED. See table 1.

Conclusion: Critically ill children presenting to the GED were older than those of the PED. GED patients were more likely to be victims of trauma and to receive a CP, most commonly EI or CVC, compared to PED patients. In both EDs, medical trainees performed the majority of CPs.

502 Radiographic Image Utilization Trends in Children Across a Large Healthcare System

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Background: U/S eliminates radiation exposure and access to U/S may lower the test threshold for imaging in appendicitis.

Objectives: We examined the rates of imaging and incidence of appendicitis among children presenting to a children's ED with possible appendicitis before and after U/S became widely available (2007 versus 2012). We also characterized those imaged with U/S according to validated low risk criteria.

Methods: We identified ED patients 3-18 years old by ICD-9 codes for unspecified abdominal pain, right lower quadrant abdominal pain or periumbilical abdominal pain and included those undergoing laboratory or radiographic tests for appendicitis. Patients were excluded if imaging occurred prior to transfer or for an indication other than appendicitis. Repeat visits within 7 days were analyzed as a single encounter. The criterion standard for appendicitis was defined by pathology reports. Trained physician researchers used a standardized case report form and explicitly defined variables to abstract study data. The study team met regularly to resolve disputes and ensure consistency.

Results: We enrolled 1407 patients in 2007 with a median age of 13 (IQR 10) years, 36% male. We enrolled 1661 patients in 2012 with a median age of 10 (IQR 8) years, 43% male. In 2007, 7 (0.5%) patients had U/S and 325 (23%) had CT imaging to detect 111 cases of appendicitis. In 2012, 410 (25%) patients had U/S and 143 (9%) had CT imaging to detect 96 cases of appendicitis. The mean number of imaging tests (CT plus U/S) per confirmed case of appendicitis rose from 3.0 in 2007 to 6.1 in 2012. U/S utilization increased from 0.06 U/S per case of appendicitis in 2007 to 4.3 in 2012 and CT decreased from 2.9 in 2007 to 1.5 in 2012. Among the patients imaged for possible appendicitis in 2012, 5% met criteria for a low risk of appendicitis and none of these patients had a confirmed diagnosis.

Conclusion: The total number of abdominal imaging studies (CT or U/S) per diagnosed case of appendicitis rose two-fold during the study period, largely driven by an increase in U/S. CT utilization decreased two-fold. The availability of U/S appears to lower the imaging threshold for appendicitis without an increase in diagnostic yield, but is associated with decreased CT utilization.

503 The Association Between Cognitive Function and Functional Status in Older Adults in the Emergency Department Setting

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Background: After an ED visit, older adults suffer poorer health outcomes compared to the general population. They are at greater risk for adverse outcomes like cognitive decline, hospitalization and nursing home admissions. Cognitive function and functional status are critical to health outcomes for older adults and are associated with high mortality rates in this population, but are not routinelyassessed in the ED.

Objectives: This study examined cognitive impairment as a predictor of functional decline in older adults in the ED. Defining the association between these two factors can advance the work of creating appropriate geriatric screens in the ED.

Methods: This was a prospective observational study at the Mount Sinai ED from February 2012- June 2015. A convenient sample of English and Spanish speaking patients, age ≥65 with capacity to consent, were surveyed. For a subset of patients, functional status was also followed up at 8 weeks. Cognitive Impairment was defined as a Short Blessed Test (SBT) score ≥10. Functional capacity was measured by the Katz Index of Activities of Daily Living (ADL). Lower functional status was defined as ADL < 6. T-test, chi-square and multivariable logistic regression analyses were completed.

Results: A total of 2,972 subjects were surveyed in the ED: mean age 76 (SD 8.0); 61% female; 36% White, 25% Black, 31% Hispanic; mean ESI 2.7 (SD 0.6); 49% were admitted; mean Comorbidity Index score was 1.8 (SD 2.2). Of these, 758 (26%) were found to be cognitively impaired (SBT≥10) and 875 (29%) had lower functional status (ADL<6). In adjusted analysis, patients with cognitive impairment were found to be at risk for lower functioning (OR=1.57; 95% CI 1.30-1.89; p< 0.0001). Among patients followed-up at 8-weeks (N=936), of those with normal function in the ED, 16% had worsened functional status; 57% of those with lower function in the ED remained with lower function.

Conclusion: Cognitive impairment is associated with lower functional status in older adults in the ED. Patients who were cognitively impaired in the ED were at greater risk for having lower functional status. At 8 weeks follow up, many of these patients continued to have lower or worsened function post ED visit.

504 Increased Geriatric ED Visits for Falls Predicted by Schmid Score

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Background: Mechanical falls remain a significant cause of morbidity and mortality among geriatric patients. Previous studies have shown a measurable reduction in falls in high risk geriatric patients who are referred for home safety evaluations and fall prevention training. Currently, there is no accepted risk stratification tool for use in the ED to identify patients who are at risk for recurrent falls.

Objectives: This study has been conducted to determine the utility of a falls risk assessment tool, Schmid score (SS), and its ability to primarily predict future ED presentation with a mechanical fall. (See Figure 1) Secondary outcomes including length of stay (LOS) in the ED and risk of readmission were also evaluated.

Methods: A convenience sample of patients aged 65 and older, previously admitted across three community EDs with an annual census of 190,000, was selected for analysis. A chart review was conducted to identify patients who returned to the ED within 90 days of hospital discharge with a mechanical fall when a SS had been documented on previous admission. The risk of readmission and LOS in the ED was collected and correlated with the fall risk assessment performed on previous admission.

Results: A total of 10,920 patients were included in this analysis with one third (37%) having SS ≥3 upon discharge. One hundred and thirty-three (1.2%) patients returned to the ED with a fall within 90 days of a hospital discharge. Those with a SS ≥3 were 2.5 times more likely to return to the ED compared to those with a SS <3 (RR = 2.5; 95% CI: 1.8, 3.6) when adjusting for age and gender. There was no statistically significant difference in the ED LOS or risk of readmission among groups.

Conclusion: Fall Risk Assessment tools, such as the SS, might be used in the ED to identify geriatric patients who are at high risk for

Figure 1-Schmid Scoring Table

Mobility	Score
Ambulates independently with no gait disturbances	0
Ambulates or transfers with assistive devices	1
Ambulates with unsteady gait and no assistance	1
Unable to ambulate or transfer	0
Mentation	
Alert, oriented X 3	0
Periodic confusion	1
Confusion at all times	1
Comatose/unresponsive	0
Elimination	
Independent in elimination	0
Independent, with frequency or diarrhea	1
Needs assistance with toileting	1
Incontinence	1
Prior Fall History (within past 6 months)	
Yes	1
No	0
Medications	
A score of 1 is given if the patient is on 1 or more of the following medications: Anti-convulsants / sedatives or psychotropics / hypnotics	1
Total	

Figure 504 – Medina

falls requiring ED evaluation, and to help guide post discharge resources that focus on home safety and mobility.

505 Admission Patterns for Older Adult Patients Presenting to the Emergency Department After a Fall: How Often is the Trauma Service Involved and Does it Matter?

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Background: Falls are the leading causes of fatal and nonfatal injuries for adults aged ≥65 and are a common reason older adults seek emergency care requiring inpatient hospital treatment.
Objectives: Our aim was to characterize admission patterns for geriatric patients who presented to the emergency department (ED) after a fall. We hypothesized that there would be differences in injury patterns and hospital length of stay (LOS) for patients with involvement of the trauma service.
Methods: We conducted a retrospective chart review on patients aged ≥65 presenting to a level 1 trauma center with a fall-related event during a 1-year period (4/11-3/12). Demographics, medical characteristics, ED trauma activation or consultation, admission service, gait testing, injury patterns, LOS, and repeat ED visits were collected. Results are presented as proportions, means (SD), and medians (IQR).
Results: 271 patients ≥65 presented with a fall. 95 (35%) were admitted to the hospital. 3 (1%) admitted patients had an ED trauma activation; 22 (8%) received an ED consultation by trauma. Of these 25 patients, 8 (32%) were admitted to the trauma service (Grp1) and 17 (68%) were admitted to another service (Grp2). 70 patients (74%) were admitted to another service without ED evaluation by trauma (Grp3).[Table] Nine patients (13%) admitted to another service without ED evaluation by trauma (Grp3) had skull/brain injuries, although they were less likely to have skull/brain or maxillofacial/dental injuries but more likely to have pelvis/buttocks injuries than either Grp1 or 2.
Conclusion: Older adults who present to the ED after a fall are infrequently evaluated by or admitted to the trauma service. Differences in injury patterns were observed in patients who had and didn't have assessment by the trauma service, but even some patients admitted with skull/brain injuries did not have trauma team involvement. Those who had no trauma involvement had a trend towards longer LOS. Future research is needed to assess whether the trauma service is being activated and consulted appropriately, whether patients admitted to trauma services have better outcomes, and whether those admitted with serious traumatic injuries without any trauma involvement have longer LOS and worse outcomes.

506 Delivery of Fall Prevention Strategies to Older Adult Fall Patients Presenting to an Emergency Department

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Background: In a given year, approximately one third of individuals over age 65 will fall. However, little is known about the provision of fall prevention services among older adults who present to the emergency department (ED) after a fall event.
Objectives: The objective of this study was to prospectively characterize the delivery fall prevention strategies and education materials by healthcare providers upon discharge.
Methods: A subset of data collected through an ongoing prospective study of injured older adults was analyzed. Adults of ages 55 years and older who fell from standing height, were transported to the region's level I trauma center via ambulance were eligible for analysis. The primary outcome was fall prevention actions implemented in the hospital or upon discharge from the ED. A detailed medical record review was conducted including the patient's discharge instructions. Data on fall prevention measures was abstracted including, 1)

Characteristics of Older Adult Patients Admitted to the Hospital After a Fall

	Grp1 (n=8)	Grp2 (n=17)	Grp3 (n=70)	*P* value
Age (years); Female	82+/− 5; 63%	83+/−8; 80%	83+/−8; 69%	0.76; 0.68
Comorbid Dementia	71%	100%	84%	0.13
Anticoagulant Use	63%	53%	52%	0.94
Opiate Pain Control in ED	100%	67%	80%	0.16
Skull/brain Injury	38%	47%	13%	0.005
Maxillofacial/dental Injury	75%	60%	21%	<0.001
Pelvis/buttocks Injury	13%	0%	32%	0.01
Hospital Length of Stay (days)	2 (1–4)	4 (1–10)	5 (3–7)	0.08
ED Revisit for Any Reason	13%	7%	13%	0.87

Table 505: Mulcare.

medication changes to reduce fall risk; 2) the use of template fall-prevention instructions; 2) personalized instructions; and 3) pre-written fall-prevention handouts.

Results: Data on 696 subjects meeting inclusion criteria were analyzed. The mean age of the sample was 82.9 years. Approximately half of study sample was treated and released from the ED (42%). Only 3% of all patients had documented medication changes made explicitly to lower the fall risk. Less than half of the patients received fall-related discharged instructions (39.8%), with 11.5% given a template fall prevention handouts and only 4.6% received personalized fall-related instructions.

Conclusion: Falls from standing height are a significant burden on the health of the older adult population. In our sample, the majority of older adults who fell from standing height did not receive fall prevention measures. Identifying barriers to improving the delivery of fall prevention strategies for older adult fallers is an area in which future research is warranted.

507 Precipitating Events, Types of Ground-Level Falls and Clinical Outcomes of Older Adult Emergency Department Patients

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Background: Data are lacking with respect to fall types and corresponding medical resource use among older adults. We hypothesized that mechanical falls would be the most common fall type.

Objectives: We characterized causes of ground-level falls among older adults presenting to an emergency department (ED), the resulting injury patterns and outcomes from these falls, and the healthcare use.

Methods: We conducted a sub-analysis from a larger prospective study of injured older adults transported via ambulance to an ED at a level I trauma center. Subjects were age 55 or older who fell from standing height and presented to the ED. A detailed medical record review included fall type, precipitating events, ED disposition, and hospital length of stay. Data was stratified by age (55-69 vs. ≥70 years) and ages 70+. This was done to enable comparison of the populations, injury patterns, and outcomes between the different age groups. Descriptive statistics were used to characterize the sample. Chi-square tests and Wilcoxon rank sum tests were used to test associations between relevant variables.

Results: Data from 696 subjects were analyzed. Mechanical falls were nearly 8 times as common as syncope events (70.8% vs. 9.0%), with falls due to slipping, tripping or stumbling being the most common cause (40.4%). Fractures were the most common type of injury sustained (36.8%) and the head was the most common body region injured (42.1%). Patients older than 70 years were more likely to sustain head injuries as compared to those younger than age 55 (47.0% vs. 35.0%; $p<0.01$). This age group also had longer hospital stays (2.5 days vs. 0.98 days; $p<0.01$) and accounted for all but one of the emergency surgeries performed within 72 hours of arrival.

Conclusion: In our sample, mechanical falls were frequent among older adults, and fractures and head injuries comprised a large majority of resulting injuries. Ground-level falls remain a significant source of morbidity, particularly for the oldest age strata.

508 Characteristics of Blunt Traumatic Injury in Older Adults: A Statewide Analysis from 2011-2014

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Background: Traumatic injury is a leading cause of death and disability in adults ≥ 65 years old, but there are few epidemiological studies addressing this issue.

Objectives: The aim of this exploratory study was to assess how characteristics of blunt traumatic injuries in adults ≥ 65 vary by age.

Methods: Using data from the Pennsylvania Trauma Outcomes Study, this retrospective cohort study examined injured patients ≥ 65 admitted to an accredited trauma center in Pennsylvania between 2011-2014 (n=38,562). Patients were stratified into three subgroups (age 65-74; 75-84; ≥ 85). Demographics, injury, and system-level variables were compared across groups using the Kruskal-Wallis test for continuous variables and the Cochran-Armitage test for categorical variables.

Results: Female sex (48.6% vs. 58.7% vs. 67.7%), white race (89.1% vs. 92.6% vs. 94.6%), and non-Hispanic ethnicity (97.5% vs. 98.6% vs. 99.4%) increased significantly with age across age groups ($p<0.001$). As age increased, the proportion of falls (69.9% vs. 82.1% vs. 90.3%), in-hospital mortality (4.6% vs. 6.2% vs. 6.8%), and proportion of patients arriving to the hospital via ambulance also increased (73.6% vs. 75.8% vs. 81.1%), while mean injury severity (10.3 vs. 10.1 vs. 9.6) and the proportion of level one trauma alerts decreased (10.6% vs. 8.2% vs. 6.7%) ($p<0.001$). No trend was seen between age and patient transfer status ($p=0.3$). The five most common diagnoses were vertebral fracture, rib fracture, head contusion, open head wound, and intracranial hemorrhage.

Conclusion: This descriptive study provides a framework for future research on the relationship between age and traumatic injury in older adults. While many of these findings are consistent with previous literature, the study highlights several new areas for further exploration such as the decrease in trauma alert level with age, the increase in mortality with age, and the decrease in demographic diversity with age among older adults receiving care at a trauma center.

509 Information Gaps in Nursing Home Patient Transfer Forms and the Effects on Emergency Physician Resource Utilization

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Background: The transfer of patient health information and coordination of care between emergency physicians and referring doctors is critical to provide quality care for a patient. Nevertheless, nursing home patients transferred to the emergency department are often subjected to fragmented care, higher costs and duplicate testing due to incomplete information.

Objectives: To determine the presence and adequacy of transfer face sheets accompanying nursing home patients upon their arrival to the emergency department and to measure differences in the utilization of emergency department resources based on information available from these forms.

Methods: This was a prospective observational study of nursing home transfers to the Mount Sinai St. Luke's Roosevelt emergency departments to assess the presence and quality of transfer forms as well as a survey of emergency physicians' perceptions of the transfer form. Senior research associates identified nursing home patients, abstracted data points from their transfer face sheets, and surveyed the emergency physician caring for the patient. Data was collected over a ten month period.

Results: 253 nursing home patient encounters were included in this study. Of these, a transfer face sheet accompanied 92.1% but only

53.1% included the primary physician's name. 48.2% included the telephone number to the nursing home facility. 24.3% of forms did not indicate the reason for transfer to the emergency department. Only 56.2% had code status documented, and due to a high rate of cognitive impairment in these patients (72.0%), only 37.1% were able to explain to the emergency physician why they were transferred. Finally, physicians reported that in 25.2% of cases, a lack of transfer information or inability to obtain an appropriate history led to over-ordering tests.

Conclusion: The use of current nursing home transfer forms is associated with information gaps in clinical history and reason for transfer in nursing home patients. These omissions impact the quality of patient care, strain emergency department resources, and may lead to catastrophic outcomes. Future research should examine the benefits of a standardized transfer form to capture the data most vital for quality patient care.

510 Skilled Nursing Home Residents vs. Community-Dwelling Older Adults: A Focused Analysis of Past Medical Histories and ED Diagnoses

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Background: Skilled nursing facility (SNF) residents are a growing presence within the older adult population and have complex medical needs. No studies have compared risk factors of SNF and community dwelling (CD) residents in an emergency department (ED) setting.

Objectives: To compare rates and risk factors for 30-day ED re-presentation and hospital admission for skilled nursing facility (SNF) and community-dwelling (CD) older adults.

Methods: This study was a retrospective chart review of 900 randomly selected patients, which consisted of 186 SNF residents and 714 CD older adults aged 65 years or older, presenting to a large urban ED over a 1-year period. Associations between demographics, medical comorbidities, and 30-day ED re-presentation and hospital admission from the ED were measured.

Results: There were 185 30-day ED re-presentations and 569 hospital admissions from the ED. The 30-day readmission rate was similar between SNF and CD residents (25% vs 24% p=0.91), whereas the hospital admission rate was slightly higher in SNF residents (69% vs 62%). For CD residents, congestive heart failure (OR = 16.33, 95% CI = 4.6-57) and chronic kidney disease (OR = 11.65, 95% CI = 2.0-68) were associated with greater risk of 30-day ED re-presentation, while diabetes (OR = 0.18, 95% CI = 0.06-0.59) was associated with a decreased risk. There were no significant predictors of 30-day ED re-presentation for SNF residents. For hospital admission from the ED, dementia (OR = 0.36, 95% CI = 0.16-0.81), cancer (OR = 0.18, 95% CI = 0.06-0.54), and diabetes (OR = 0.38, 95% CI = 0.51-0.96) were associated with less risk in SNF patient. In CD residents, arrhythmia (OR = 1.74, 95% CI = 1.02-2.95) was associated with greater risk of hospital admission, while behavioral health (OR = 0.51, 95% CI = 0.31-0.85) was associated with a decreased risk.

Conclusion: Different rates of 30-day ED re-presentation and hospital admissions from the ED suggest important patient characteristics associated with CD and SNF older adult populations. Different risk factors between the groups may contribute to clinical prediction algorithms and thus, help direct clinical interventions.

511 Improving Severe Sepsis Order Set Compliance in the Emergency Department

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Background: Improving early recognition and treatment of severe sepsis and septic shock was a goal of the Delivery Systems Reform Incentive Program (DSRIP), a federal pay-for-performance initiative implemented in public hospitals in California from 2011-2015. The suggested milestone was a 30% increase in sepsis bundle compliant treatment of these patients from a baseline calculated at the beginning of the five-year reporting period.

Objectives: Our objective was to determine if quality improvement interventions could increase sepsis bundle compliance.

Methods: This was a before and after study evaluating the impact of a quality improvement bundle. ED patients with diagnostic codes for severe sepsis or septic shock present were included. Patients were excluded if they had a do not resuscitate code. The bundle, implemented December 1, 2014, included: 1) a nursing education campaign led by Quality and Safety Nurse Champion focused on timely antibiotic administration and individualized feedback to nurses on their compliance, 2) physician education led by the Director of Quality for Emergency Medicine focused on bundle components and electronic health record (EHR) order set utility, 3) individual physician feedback comparing bundle compliance rates with peers, and 4) a hard stop EHR best practice alert. The primary outcomes were compliance with recommended antibiotics and the sepsis bundle (which includes 20cc/kg IV fluid bolus, antibiotic administration, blood cultures drawn before antibiotics administered and lactate ordered).

Results: 41 eligible patients presented in the month prior to the intervention and 54 eligible patients presented in the 6th month after intervention. Antibiotic compliance increased from 22/41, 53.7% (95%CI 37.4-69.3) before to 41/54, 75.9% (95%CI 62.4-86.5) after the interventions, difference 22.2% (95% CI 3.2-41.3%), p=0.02. Overall bundle compliance increased from 18/41, 43.9% (95%CI 28.5-60.3) before to 39/54, 72.2% (95%CI 58.4-83.5) after the interventions, difference 28% (95% CI 9.0-47.6%), p=0.005.

Conclusion: Simple yet focused interventions can increase compliance in critically ill patients in a complex healthcare environment. Future studies should evaluate the individual impact of each of the four interventions implemented in the bundle.

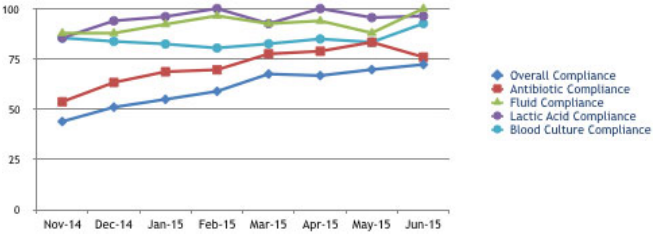

Figure 511 – McBeth

512 ASCERtain: Automated Sepsis Capture for Emergency Department Registries

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Background: Timely and accurate diagnosis of sepsis, severe sepsis, and septic shock is essential to initiating interventions that decrease mortality and improve outcomes. Sepsis diagnosis also informs prognostication, disposition and resource allocation. Recently, the Centers for Medicare & Medicaid Services (CMS) added sepsis "core measures" such that compliance with Surviving Sepsis guidelines are tied to publicly-available pay-for-performance metrics.

Objectives: Our goal was creation of a fully automated maximally sensitive and specific computer algorithm that leverages the electronic medical record (EMR) to identify patients admitted from the ED with sepsis, severe sepsis, and septic shock. Existing methods are inadequate for purposes of patient care, clinical research, and hospital reimbursement.

Methods: Retrospective manual chart review was performed on an entire month of ED data at an academic hospital. Patients were

considered "sepsis +" if the physician reviewer deemed that "documented or suspected infection" was present at the time of admission. These results were used as the gold standard on which to construct algorithm coding. Subsequently, manual chart review of another month of admissions was conducted by physicians blinded to algorithm coding and results to enable calculation of statistical performance measures and inter-rater reliability.

Results: ASCERtain first screens admitted patients for systemic inflammatory response syndrome (SIRS) criteria. Novel inclusion and exclusion criteria then determine whether sepsis (i.e. "documented or suspected infection") exist. Finally, the algorithm applies consensus definitions to correctly stratify severe sepsis (organ dysfunction) or septic shock (hypotension or hyperlactatemia). Inter-rater reliability analysis of blinded manual chart review showed "almost perfect" agreement (Kappa = 0.93) and ASCERtain performed favorably compared to this gold-standard (*Figure 1*).

Conclusion: Our automated algorithm identifies Emergency Department patients admitted for sepsis, severe sepsis, and septic shock with ~97% sensitivity and 98% specificity. This accuracy exceeds previously described rule-based methods. ASCERtain can be coded into any existing electronic medical record.

	Sepsis (+)	Sepsis (-)
ASCERtain (+)	375	3
ASCERtain (-)	12	123

Sensitivity	97%
Specificity	98%
PPV	99%
NPV	91%

Figure 1. Statistical performance measures. (PPV=positive predictive value) (NPV=negative predictive value)

Figure 512 – Glazer

513 Reducing Unnecessary Coagulation Studies in Chest Pain Patients: A Multicenter CPOE Intervention

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Background: In light of escalating health care costs, initiatives such as Choosing Wisely advocate the need to "reduce unnecessary or wasteful medical tests, treatments and procedures". Considerable evidence exists to suggest a low yield of doing routine coagulation studies in suspected cardiac chest pain patients (SCCP).

Objectives: We sought to quantify the impact of removing routine coagulation studies from our computerized order entry system's (CPOE) suspected cardiac chest pain (SCCP) order set.

Methods: This study was performed in four adult EDs with an annual combined census of 320,000 visits/year and a common, shared CPOE system and EMR. The intervention involved modifying the pre-selected coagulation studies from the nursing CPOE order set for SCCP and providing education around appropriate usage of coagulation studies. Patients were included in the study if the clinician ordered labs using one of the relevant SCCP order sets. The primary outcome was to compare the number of coagulation studies pre and post-intervention. Outcomes were assessed using CPOE and ED administrative data 90 days pre- and 90 post-intervention (Pre-intervention: May 20, 2015 to August 19th 2015, Post-intervention: August 20th, 2015 to November 18th 2015).

Results: Our analysis included 6195 patients who had coagulation studies ordered in the ED as part of a SCCP pathway. In the pre-intervention phase, 4982 patients had routine (pre-selected) coagulation studies ordered by nursing staff, 219 ordered by ED physicians, for a total of 5201 coagulation studies in the pre-intervention phase. In the post-intervention phase, 776 coagulation studies were ordered by nursing staff and 218 additional tests were ordered by ED physicians for a total of 994 coagulation studies. With our intervention, we identified a net reduction of 4207 coagulation studies in our post-intervention phase for a reduction of 80.88%. At a cost of 15.00$ (CDN$ at our center), we would realize a cost -saving of $63,105 for this intervention over a 90 day period.

Conclusion: We have implemented a sustainable, high-impact and cost-saving intervention that significantly minimizes the use of coagulation studies in patients presenting with SCCP.

514 Consolidation of Information Standards Related to Emergency Care

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Background: Meaningful Use (MU) of Health Information Technology (HIT) specifications require increasing adoption of health information standards to support interoperability and secondary uses of health information. We describe a process at the Health Level 7 (HL7) Standards Development Organization to incorporate emergency care domain expertise into ongoing HIT standards development.

Objectives: Create and maintain a consolidated model of emergency care relevant information standards that provides a foundation for researchers, systems developers, policy makers, and standards developers to interact with data and processes in the Emergency Department (ED).

Methods: HL7 supports formal methods for development of information models related to clinical domains. The HL7 Emergency Care Workgroup (ECWG) members meet face-to-face three times a year at HL7 meetings and hold weekly conference calls. Formal project plans are approved and supported by HL7. The ECWG then solicited input from EC information from vendors, EC providers, military and

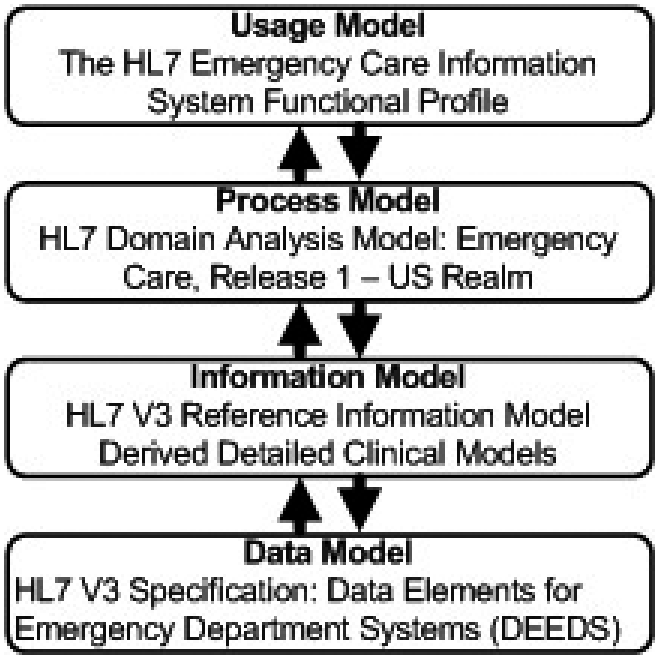

Figure 514 – McClay

reporting agencies to determine the scope of the field. Other standards supported by HL7 and HHS was then extracted to meet the needs of the ED information space. The resultant specifications were subjected to standard HL7 peer review through a formal balloting process before being published as a standard.

Results: The "Common Model of Emergency Care Information (CMECI)" contains four specifications (figure 1). A business process model of ED work and an underlying data model maps EC related data elements to standardized vocabularies. HL7 creates and ballots detailed information models (DCM) for commonly represented concepts such as blood pressure and patient address. The relevant DCM are linked to discrete data elements in DEEDS and source activities in the ED. The HL7 EHR Functional Model provides ED related functions into an ED IS functional profile.

Conclusion: Rapid advances in the creation of standardized, interoperable health information systems have been catalyzed by recent federal regulations. The CMECI is an iterative project to organize existing information standards related to emergency care as well as informs the ongoing development of further specifications and regulations. These explicit specifications benefit all users of ED information technology.

515 Predictors of Pediatric Emergency Room Utilization in Santiago, Dominican Republic

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Background: In low resource settings, maximizing effective use of emergency room (ER) services is imperative. This problem is anecdotally observed in the public hospital setting in Santiago, Dominican Republic (DR). There are no studies presently published examining ER use in this pediatric population or reasons caregivers choose to utilize the pediatric ER. Financial and systemic limitations have been previously cited as important contributors to the high pediatric mortality rate in the DR.

Objectives: To identify factors associated with pediatric ER utilization in this urban community hospital.

Methods: In this cross-sectional, descriptive study, a survey was administered to 117 caregivers (e.g. mother, father) of children in the ER at Hospital Especializado Juan XXIII over an eight-week period. Survey questions included perceived urgency of illness, education level, monthly income, and frequency of ER visits in the last six months. We defined frequent ER visits as greater than four visits within the last six months, low income as below 10,000 pesos/month, and low education as having no high school education. Logistic regression was used to assess significant associations between variables.

Results: Caregivers in the pediatric ER were predominantly female (94%) with a mean age of 30 $\pm$ 11 years. Children of caregivers with any high school education had 69% lower odds of having 4 or more ED visits in the last 6 months (OR, 0.31; 95% CI, 0.13-0.75; p=0.009), compared to children of caregivers with no high school education, after adjusting for the income category of the caregiver. Additionally, 72% of respondents reported the child's problem as "extremely urgent," while 82% of the children were triaged as non-urgent.

Conclusion: Low education level is associated with increased pediatric ER use over a six-month period. Caregivers and medical providers perceive disparate levels of urgency of pediatric medical problems, which may also contribute to increased use of the ER for non-urgent medical problems. Assessing utilization of pediatric ERs in the public health care system in Santiago could provide a framework for the design of targeted educational and systemic changes, supporting the ultimate goal of providing the best possible care for pediatric patients in low-resource settings.

516 Pioneering Simulation and Small Group Learning in Tanzania: East Africa's First EM Residency

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Background: Simulation-based and small group learning (SGL) are now cornerstones of US emergency medicine (EM) education. EM training in East Africa is still largely nascent, despite the overwhelming need for trained EM specialists. These educational modalities have been recently introduced to Muhimbili National Hospital's EM residency in Tanzania, the first and only EM training program in East Africa.

Objectives: This study investigates the acceptability of SGL and simulation learning, in comparison to traditional didactic lectures, for physicians training in an academic Tanzanian emergency department.

Methods: Using qualitative and Likert-scale survey responses, we explored the perceived effectiveness of SGL compared to traditional didactic lectures among 38 emergency department physician-learners at Muhimbili Hospital. Major qualitative themes were identified, and regression analyses were used to determine strength of association between quantitative outcomes.

Results: Reported benefits of SGL and simulation training included team building, the enhancement of procedural skills, and the opportunity to discuss opinions about clinical management. SGL scored more favorably at improving clinical practice, enjoyment of learning, and building peer-to-peer relations. Lectures scored more favorably at improving medical knowledge. Preference towards SGL over lectures for overall training increased with years of clinical experience (95%CI 0.16-0.62, p=0.002, Spearman's rho 0.51), and the perception that SGL reinforces learner-teacher relationships correlated with seniority within residency training (95%CI 0.14-0.86, p=0.007, Spearman's rho 0.47).

Conclusion: SGL and simulation training were perceived favorably for improving medical knowledge and clinical practice. These modalities may be crucial for adult learners training in resource-limited settings such as Tanzania. This curriculum could serve as a model to develop EM education for other countries in the East African region.

Table 1: Perceived effectiveness of lectures versus SGL (N=38)

1 = lectures much more effective, 2 = lectures more effective, 3 = neutral, 4 = small groups more effective, 5 = small groups much more effective	Mean (SD)
1. Improving medical knowledge	2.20 (1.15)
2. Improving clinical practice	4.12 (0.86)
3. Ability to organize what you've learned	3.79 (0.96)
4. Defining/clarifying of learning objectives during lesson	2.82 (1.31)
5. Developing clinical / diagnostic reasoning	3.24 (1.35)
6. Developing independent critical thinking	3.45 (1.42)
7. Enjoyment of learning	4.15 (0.87)
8. Motivation to learn more on your own	3.27 (1.31)
9. Reinforcing learner to learner relationship building	4.12 (0.88)
10. Reinforcing learner to teacher relationship building	3.53 (1.35)
11. Overall training	3.45 (1.09)

Table 516: Lim.

517 Understanding the Medical Needs of a Local Refugee Population Amidst the Global Refugee Crisis

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Background: 59.5 million refugees were forcibly displaced in 2014, the highest level ever recorded. The United States relocates between 70,000-80,000 refugees per year. One in 3 refugees seek care at U.S. emergency departments after relocation, often making emergency physicians the first line of health care for many refugees.

Objectives: To determine the healthcare risks and needs of the Utah refugee population.

Methods: Federal and state databases were reviewed to compare and evaluate the demographics of Utah's refugee population including: sex, country of nativity, country of arrival, disease exposure risk for both native and arrival country, local state arrival health care screening protocols, results, and access to healthcare resources. A review of published and grey literature was conducted regarding refugee utilization of healthcare resources.

Results: Utah currently houses more than 20,000 refugees, speaking over 40 languages. Utah resettles approximately 1,200 refugees per year. 50% of Utah refugees are women, and more than 58% of refugees are under the age of 25. 2014 statistics revealed 1,286 refugees were relocated from 35 different countries of nativity (birth place), and 44 separate countries of arrival (location of refugee camps). This is an important distinction as many refugees have lived in a separate country from their country of nativity, with distinct health related exposures from their country of arrival. 97% of Utah refuges undergo health screening within their first 30 days. Highest reported health care needs of Utah refugees since 2005 are TB (n=2,000), Parasites (n=1,500), and Hepatitis (n=300). Other health care needs include care and treatment of HIV and other sexually transmitted infections.

Conclusion: Utah has a diverse refugee population with unique health care needs. Given how frequently refugees visit the emergency department, Emergency Physicians should understand the complex psychosocial and medical needs of their local refugee populations, including the health associated risks related to countries of nativity and arrival. Refugees present a vulnerable patient population with a need for further study and system improvement to understand and assist this at risk group.

518 Epidemiology of Diseases Presenting to One of the World's Largest Mass Gatherings

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Background: The Kumbh Mela is a large religious gathering that occurs once every few years in one of four Indian cities. The 2015 Mela, attended by over 10 million, was held from August to September in the adjacent cities of Nashik and Trimbakeshwar. Malaria, swine flu, and dengue were endemic in the region and the potential for widespread contagion was high. The research team, in partnership with the local governments, studied the epidemiology of diseases presenting to the Mela. Real time data were collected via a novel mobile tablet surveillance system with immediate data visualization capabilities.

Objectives: Real time epidemiological data were collected to look for potential epidemics, and to match material and human resources to patient demand in real time.

Methods: Data were collected by a combination of paper-based records and mobile tablets at over 50 clinics. For each digitized patient encounter, the physician recorded the patient's age, gender, and provisional diagnoses - enough information for a robust surveillance system. The digital record was linked to a more comprehensive paper record via a unique identification number.

Results: A total of 36,343 patient visits (35,216 adults and 1,127 children) were recorded at 35 of the busiest clinics on the 9 key days of the festival. Over 19,000 patients visited the clinics from September 12-14, prompting officials to increase staffing at the high volume sites. The most common diagnoses were upper respiratory complaints (26%), joint pain (16%), fever (14%), body ache (13%), and headache (7%). With regard to high acuity illnesses, there were four cases of dengue, 28 cases of malaria and a diarrheal outbreak prompting a field investigation. Common complaints seen in US EDs including chest pain, dyspnea, syncope, and stroke represented less than 5% of the total presentations combined.

Conclusion: A vast number of resources were mobilized by the government to care for the pilgrims. Most patients had minor complaints that were symptomatically treated (not unlike other mass gatherings). Real-time access to clinic data allowed outbreak monitoring and time-sensitive matching of supply and demand.

519 Language Disparity in Health Literacy

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Background: Previous studies have shown that patients with limited health literacy have higher ED utilization. The effect of language disparity on health literacy is unclear in this setting.

Objectives: Our hypothesis was that limited health literacy is related to demographic characteristics, particularly primary language.

Methods: Adult Spanish and English speaking patients who presented to triage during 2014-2015 were recruited in a prospective convenience sample in an urban academic ED. Participants completed in-person interviews for demographic information and a health literacy assessment using the Newest Vital Sign survey, a 6 question scale validated both in English and in Spanish. Those with limited literacy were defined as having NVS scores of 0-3; those with adequate health literacy were defined as scoring a 4-6. A multivariable logistic regression was performed with health literacy as the independent variable and age, language, gender, ethnicity and insurance status as predictor variables.

Results: 250 English-speaking and 257 Spanish-speaking participants were recruited during the study period. Per NVS, 71% (359/507) of all patients had limited health literacy. Significantly more Spanish than English-speaking patients had low health literacy (93% vs 48%, diff=45%, 95%CI=37,51). There was no significant difference in

	Comparison	Beta (SE)	aOR	95%CI	Sig
Age	30 vs 40 yrs old	0.33(0.08)	1.39	1.19,1.63	<0.01
Language	English vs Spanish	2.0(0.3)	7.3	3.8,13.8	<0.01
Male Gender	Female vs Male	0.01(0.2)	1.0	(0.6,1.6)	0.9
Ethnicity	Comparison to Caucasian				<0.01
Hispanic		1.2(0.3)	3.2	1.7,5.9	<0.01
Other		0.5(0.3)	1.6	0.8,3.2	0.2
Insurance	Comparison to Private insurance				<0.01
Government		1.2(0.4)	3.3	1.6,6.9	<0.01
Self		1.5(0.4)	4.3	1.8,10.0	<0.01
Other		0.7(0.5)	2.1	0.8,5.4	0.1

Table 519: King.

ambulance arrival, length of stay or admissions between the 2 groups. Multivariable regression results are shown in the table. Spanish speaking patients had over 7 times higher odds of having limited health literacy. (OR=7.3,95%CI=3.8,13.8).

Conclusion: Limited health literacy subjects are more likely to be Spanish-speaking, be older, be Hispanic ethnicity and have government or self-pay insurance. A focus on providing different health information to this group may be necessary.

520 Alternatives to the Emergency Department: ED Patient Usage and Perceptions of Availability

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Background: Between 1999 and 2009, the number of emergency department (ED) visits in the U.S. increased by 32%, from 102.8 to 136.1 million. Volume is expected to further increase when a significant majority of 32 million previously uninsured Americans enroll in health insurance for the first time under the Affordable Care Act of 2010 (ACA). This may lead to more overcrowding conditions in the nation's EDs. As a result, determining alternatives to care in the ED is increasingly an issue of importance.

Objectives: The purpose of this analysis was to look at ED patient usage and perceptions of neighborhood availability of ED alternatives, including urgent care centers, community health centers, and retail clinics (in a store or pharmacy).

Methods: A convenience sample of 34 adult ED patients were surveyed in an urban academic medical center. A research assistant verbally administered the survey to overcome any literacy issues in the patient population. After consenting to participate, participants were asked about the availability of community health resources in their neighborhood, as well as how often they used these community health resources in the past 6 months. Demographic characteristics were also collected.

Results: Average age was 46.1 (SD=17.4) years and 53% of participants were female. 68% were African American, 21% were Hispanic, and 94% of participants had a primary care provider. 82% said that urgent care centers were somewhat or very available in their neighborhoods, however when asked in the past 6 months how often they used an urgent care center, 79% said never or rarely. Over half (58%) of participants said that community health centers were somewhat or very available in their neighborhood, while 85% said they never or rarely use them. Finally, 73% said that retail clinics were somewhat or very available, but 74% never or rarely used them.

Conclusion: Overall, the ED patients surveyed believed that alternatives to the ED were available in their neighborhood, however these patients did not use them. Work needs to be done to determine the reasons behind the lack of use to see if such alternatives would be appropriate. Furthermore, it would be prudent to also survey people who use these community health resources to compare characteristics of the two groups.

521 ED Visits for Ambulatory Care Sensitive Conditions (ACSC) After the Establishment of a Pioneer ACO

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Background: Ambulatory Care Sensitive Conditions (ACSC) are conditions where timely and effective ambulatory care can decrease ED visits by preventing the onset of an illness, controlling an acute episode of an illness, or managing a chronic condition. High rates of ACSC ED visits in a community may be an indicator of a lack of or failure of prevention efforts, a primary care resource shortage, poor performance of primary care, or other factors that create barriers to timely and effective care. On Jan. 1, 2012, CMS instituted the Pioneer Accountable Care Organization (ACO) program. ACOs have a financial incentive to control costs by managing an entire episode of care for a patient. Given the costs of ED care relative to primary care, ACOs have a financial incentive to reduce ED visits for ACSC.

Objectives: Determine if ACSC visits to tertiary ED associated with a Pioneer ACO declined after implementation of the Pioneer ACO program.

Methods: The setting was an urban, tertiary teaching hospital with an annual ED volume of 55,000 pts. that serves as the only tertiary ED associated with a particular Pioneer ACO. A clinical data registry consisting of all patients' visits starting 7/1/2010 was created, containing fields that included patient entry time and ICD-9 diagnosis codes. Primary ICD-9 codes were grouped into ACSC and non-ACSC previously described criteria. We performed a retrospective pre/post time series analysis of ED visits for ACSC and non-ACSC analysis to determine changes in ACSC and non-ACSC ED visits over time.

Results: After initiation of the Pioneer ACO program, the number of ACSC visits declined ($p<0.001$), while non-ACSC visits remained statistically similar ($p=0.60$). Controlling for temporal trends, ACSC visits per month and the percentage of ACSC visits both were significantly lower ($p<0.001$ and $p=0.004$, respectively), while adjusted non-ACSC visits remained the same ($p=0.32$).

Conclusion: The initiation of a Pioneer ACO program was associated with a reduction in the rate of ACSC visits to a tertiary ED associated with a Pioneer ACO, but not with a reduction of non-ACSC ED visits.

ACSC Before/After ACO

(medians with interquartile ranges)

	Before ACO	After ACO	*p*-value
Months evaluated	18	44	
Total visits per month	4823 (4556-4893)	4662 (4515-4813)	0.10
ACSC visits per month	610 (599-634)	560 (538-582)	<0.001
Non-ACSC visits per month	4190 (3947-4258)	4092 (3898-4247)	0.603
ACSC out of total visits, %	13.1 (12.5-13.7)	12.2 (11.4-12.7)	<0.001

Table 521: Epstein.

522 Focused Evaluation of Patients Who Self-Report Opiate Use in the Emergency Department

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Background: With a 400% increase in narcotics prescribing over 10 years, 100 million chronic pain patients at a cost of $72.6 billion, narcotics use, abuse and prescribing has become a significant public health issue.

Objectives: This study aimed to gather specific data from patients who presented to the ED and reported opiates as part of their medication regimen with attention to duration of opiate use and main source of opiate prescriptions.

Methods: We did a case control study using a single round, categorical and Likert scale survey to a sample of ambulatory, non-urgent patients presenting to the ED at an urban tertiary care hospital and Level 1 Trauma Center with an annual census of 65,000. Cases were identified by the presence of an opiate medication on their triage medication list. Control subjects with no self-reported opiate use were recruited near concurrent to cases. Any patient with an ESI of 1 or 2, non-English speakers and those unable to provide consent were excluded. Data were analyzed using logistic regression.

Results: A total of 290 patients were enrolled, 157 cases and 133 controls. The average age of the cases was 57.2 years (SD 14.90) vs 59.7

years (SD 15.07) for controls. There were no statistically significant differences among the groups for gender or race. Prescription opiate users were more likely to report smoking tobacco (OR 1.94; 95% CI 1.13-3.32) and marijuana (OR 4.97; 95% CI 1.08-22.82). For cases, 92% reported chronic pain and 85.9% reported acute pain on the day of enrollment. 27% reported < 3 month duration of opiate use, 18% for 6-12 months, and 42% for greater than 2 years. 96% of cases and 91% of controls reported having a primary care physician (PCP). Cases were more likely to report having at least one medical specialist (OR 6.33, 95% CI 3.71-10.7). Cases were more likely to report psychiatric medications (OR 2.76, 95% CI1.61-4.71) and GI medications, including stool softeners (OR 3.36, 95%CI 2.01-5.64) as part of their medication regimens. There was a statically significant difference between the groups when primary care physicians were prescribers for opiates (p=0), psychiatric medications (p= 0.0006) and GI medications (p= 0.0006).

Conclusion: Self reported opiate users were more likely to suffer chronic pain, psychiatric illness, such as anxiety, and to obtain prescriptions from their PCP.

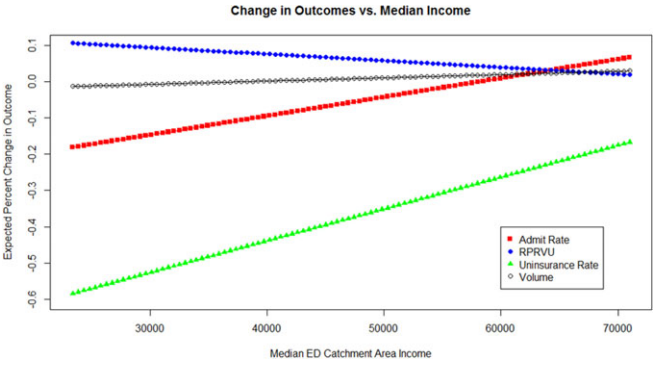

Figure 523 – Pimentel

523 Impact of Health Policy Changes on Emergency Medicine Practice by Socioeconomic Status

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Background: On January 1, 2014, healthcare in Maryland (MD) profoundly changed. The insurance provisions of the Affordable Care Act (ACA) began and a revision of MD's Medicare Waiver ushered in a global budget revenue (GBR) structure for hospital reimbursement.

Objectives: We analyzed the impact of these changes on access to Emergency Department (ED) care, admission practices, uninsured rates, and professional revenue. We stratified our analysis by the socioeconomic status (SES) of the ED population.

Methods: Monthly mean data including patient volume, admission and observation percentage, payer mix, and professional revenue were collected from January 2013 through June 2015 from a convenience sample of 11 EDs in the state of MD. Study EDs ranged from small rural departments to large urban teaching EDs. Using regression analysis, we compared each of the variables 18 months after the policy changes to the year prior to ACA/GBR implementation. We included the median income of each ED's patient population as an explanatory variable and stratified our results by SES.

Results: Our 11 EDs saw a total of 402,248 patient visits during calendar year 2014. This ranged from a mean of 42 daily visits in the lowest volume rural ED to 172 in the highest volume urban ED. After ACA/GBR, ED volumes increased by an insignificant .49 visits per day (95% CI: (-0.65, 1.63), p=0.40). Admission plus observation percentages decreased significantly by an absolute 1.3% from 17.2% to 15.9% (95% CI: (-1.8%, -.8%), p=0.00). The percentage of uninsured patients decreased from 20.4% to 12.1%. This 8.3% absolute change was significant (95% CI: (-9.0%, -7.5%), p=0.00). The professional revenue per relative value unit increased significantly by $2.58 (95% CI: (1.83, 3.33), p=0.00). When stratified by the median patient income of each ED, changes in each outcome were significantly more pronounced in EDs of lower SES. See Figure 1.

Conclusion: Health policy changes at the federal and state levels have resulted in significant changes to emergency medicine practice and finances in MD. Admission and observation percentages have been reduced, fewer patients are uninsured, and professional revenue has increased. ED volume has not changed. All changes are significantly more pronounced in EDs with patients of lower SES.

524 Short-Term Death After Discharge From U.S. Emergency Departments: Analysis of 3.7 Million Visits by Medicare Beneficiaries

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Background: The decision to admit or discharge patients from emergency departments (EDs) is common and challenging. Patients who die soon after discharge are sentinel events that may point to quality and safety gaps.

Objectives: To understand diagnostic errors or other gaps in quality and safety among patients who die shortly after ED discharge.

Methods: We identified deaths within 14 days of ED discharge in a 20% nationally-representative Medicare sample from 2010, excluding those with prior life-limiting illnesses. We systematically explored the relationship of this outcome to patient and hospital factors.

Results: Of 2,187,756 beneficiaries without prior life-limiting illnesses discharged from EDs, 9322 (0.4%) died within 14 days. Small increases in ED-to-inpatient admission rate were linked to large decreases in short-term death after discharge: hospitals in the lowest decile of admission rates (<15% of Medicare patients) had short-term mortality 0.7% (95%-CI: 0.6-0.7%); median hospitals admitted 32%, with short-term mortality 0.3% (95%-CI: 0.3-0.3%). Atherosclerosis (8.6%), myocardial infarction (7.8%), and chronic obstructive pulmonary disease (5.5%) were the most common causes of death from death certificates. Certain discharge diagnoses were significantly more common in short-term deaths vs. all other visits: conditions with a spectrum of severity (e.g., pneumonia), where outpatient management is reasonable for low-risk patients, and some syndromic diagnoses (e.g. dehydration). Pain syndromes (e.g., chest pain), however, were significantly less common. In multivariate analysis, rural EDs, and EDs with lower patient volumes and lower per-patient charges, had significantly more short-term deaths.

Conclusion: One in 250 Medicare beneficiaries died soon after discharge from EDs, despite no evidence of life-limiting illness. EDs with low care intensity, and patients with certain high-risk diagnoses, could be targets for patient safety efforts.

525 Frequent Users of the Emergency Department with Mental Health Diagnoses

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Background: Frequent users of the emergency department (ED), defined as patients with four or more visits in one year, account for a

disproportionate percentage of ED visits and expenditures. A large fraction of the frequent user population has a least one mental health diagnosis, but within the population of mentally ill patients, little is know about what specific diagnoses and characteristics are associated with frequent ED visits.

Objectives: We aimed to define demographic and clinical characteristics, including diagnoses of frequent ED users with MI. Within the group of patients with mental illness, we additionally sought to compare frequent ED users to non-frequent ED users.

Methods: We used 2012-2013 data from the Office of Statewide Planning and Development (OSHPD) California-wide database to construct a retrospective cohort of all patients presenting to a California ED in 2013. Each patient was matched to his or her prior utilization at all California hospitals within a 12-month look back period. We used the Healthcare Cost and Utilization Project's Clinical Classification System to categorize mental health diagnoses. The sample included 2,575,584 visits from 1,003,211 patients with at least one diagnosis of mental illness.

Results: We found a larger proportion of frequent ED users among patients with MI as compared to those with no MI. Nearly half of all patients with MI had at least one mental health related primary ED discharge diagnosis. Anxiety disorders (OR=1.73, CI: 1.70-1.76) and schizophrenia and other psychotic disorders (OR=1.66, CI: 1.61-1.70) were the mental health diagnosis groups most strongly associated with frequent ED use. Non-diagnosis related factors such as the fraction of poverty in the patient's home zip code (OR=1.89, CI: 1.75-2.05) and Medicaid insurance coverage (OR=3.02, CI: 2.97-3.07) or being uninsured (OR=2.64, CI: 2.60-2.69) were also strongly associated with frequent use of the ED.

Conclusion: Among ED users with MI, specific mental health diagnoses played a comparatively small role in predicting frequent use relative to non-medical factors such as poverty and insurance status. Improving access to care, including via outpatient mental health services and care coordination, and addressing community factors related to poverty may be needed to address frequent ED use in patients with MI.

526 Patient Navigation for Patients Frequently Visiting the Emergency Department

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Background: ED super utilizers (patients with 5 or more visits/year) comprise only 2% of the patients seen yet comprise 11% of total ED visits. Though the reasons for this are multifactorial, the cost to the patient and the community is exceedingly high. The cost is not just monetary; care of these patients is inappropriately fragmented and their presence in the ED contributes to overcrowding affecting the community's emergency readiness. Previous studies using staff trained to help patients navigate their care options have had conflicting results.

Objectives: To determine whether a trained Patient Navigator (PN) can reduce ED use in super utilizers over a 6-month period.

Methods: Super-utilizers were enrolled in a prospective randomized controlled clinical trial. Patients who were randomized into the treatment arm met with a PN who reviewed their diagnosis with its associated care plan and identified community resources for follow-up. The remaining control group was provided standard care. Both groups were given a follow-up survey by the PN that assessed prescription use, primary care follow-up and patient satisfaction using a 4-point Likert scale. After six months, the patients' return ED visits were compared to the year prior. Also satisfaction, primary care and medication compliance were measured using Student-T tests with Bonferroni correction or Mann-Whitney U tests.

Results: 280 patients were enrolled (146 in navigation, 134 controls). Patients were similarly matched in age, race, gender, insurance and chief complaints. With 6-month follow-up on 74% of the patients there is no significant difference between groups in the number of patients with a reduction ED visits: 81.3% in the treatment group vs 79.2% in the control group ($p>0.05$). Return visits were significantly reduced in both groups compared to the previous year (8.1 vs 2.5, $p<0.01$). There with no differences in satisfaction, prescription use, or primary care visits between groups.

Conclusion: Our data showed no differences between groups in ED utilization, patient satisfaction, primary care use or prescription use. However, overall number of return visits did decrease for both groups, potentially inferring a placebo effect for the use of a PN. Further exploration of this effect and extending the follow-up out to one year are currently being undertaken.

527 Retrospective Review of Repeat Ultrasounds After Point-of-Care Ultrasound for Acute Cholecystitis in the Emergency Department

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Background: Point of care ultrasound (PoC US) performed by emergency physicians (EPs) is becoming a first-line test to diagnose cholecystitis. PoC US findings consistent with cholecystitis include gallstones and sonographic murphy's, with the possible development of gallbladder wall thickening (GBWT) and pericholecystic fluid (PCF) over an unknown period of time. Development of PCF or GBWT is important as the development of either strengthens the diagnosis of cholecystitis in cases that may otherwise be equivocal.

Objectives: We sought to better define the timeframe for the development of GBWT and PCF among ED patients diagnosed with acute cholecystitis. Specifically, how often does GBWT and PCF develop among patients with right upper quadrant pain and cholelithiasis within 24 hours?

Methods: We reviewed a database of biliary PoC US exams performed by ED providers at a single institution between June 2012 to December 2013 for all cases positive for cholelithiasis that also had a radiology ultrasound performed within 24 hours of the initial PoC US. We recorded the presence or absence of GBWT or PCF among PoC US and radiology US cases, as well as the time in minutes between studies.

Results: There were 1736 biliary PoC US reviewed in our ED from June 2012 through December 2013. Of these, 369 were interpreted as having gallstones. 226 patients had repeat ultrasounds in the next 24 hours, and 118 of these patients had a final diagnosis of acute cholecystitis. Of the 226 patients with cholelithiasis and repeat ultrasounds, 30 patients (13.3%) had interval development of GBWT and 14 patients (6.2%) had interval development of PCF. 44 patients (19.5%) had interval development of either GBWT or PCF. The average time interval between studies for development of GBWT and PCF was 257 and 364 minutes, respectively. One-hundred and 82 patients had no change between ultrasounds. See Table 1.

Conclusion: Patients with an equivocal initial US or with persistent pain may benefit from a repeat US to evaluate for evolution of findings on US for acute cholecystitis.

	PoC US (n)	Radiology US (n)	n with interval development (%)	Mean interval time between studies
GBWT	17	101	30 (13.3)	257
PCF	49	63	14 (6.2)	364
GBWT and PCF	23	29	6 (2.7)	216
No Change	186	186	0	317

Table 527: Stimson.

528 Cholecystitis Diagnosed by Emergency Department Point-of-Care Ultrasound (POCUS)

Carlos Calaf, Tina Dulani, Maya Lin, Andrew Balk, Henry Mayo-Malesky, Alexander Wang, Lawrence Melniker, and Gerardo Chiricolo

Table 528
Calaf

		ED-LOS	p value	T2OR	p value	H-LOS	p value
POCUS [P]	N=37	4.75		36.81		67.59	
CCUS [C]	N=4	7.08	0.17	71.50	0.08	102	0.09
BOTH [B]	N=68	5.67	0.07	59.01	0.02	93.74	0.02
CLOSED	N=65	5.03		45.42		76.60	
OPEN	N=45	5.97	0.06	61.57	0.07	97.82	0.05
Closed [P vs B]			0.10		0.10		0.06

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Background: The American College of Radiology (ACR) recommends ultrasound as the imaging modality of choice for patients with right upper quadrant pain and suspected gallbladder disease. Ultrasound is 90-95 percent sensitive for cholecystitis and is 78-80 percent specific. Either clinician-performed point of care ultrasound (POCUS) or comprehensive consultative ultrasonography (CCUS) can be used to diagnose cholecystitis. Studies indicate that emergency clinicians require minimal training to effectively use right upper quadrant ultrasonography in their practice.

Objectives: To show that POCUS reduces time to emergency department disposition (ED-LOS), time to OR (TOR) and hospital length of stay (H-LOS) in patients diagnosed with cholecystitis.

Methods: A retrospective chart review was done of all patients who presented to the emergency department between January 1, 2013 and June 1, 2015 for abdominal pain and had cholecystitis as discharge diagnosis. The POCUS use was compared to CCUS for ED-LOS, TOR, and H-LOS using unpaired t-tests with alpha set at 0.10.

Results: POCUS was associated with decreased TOR and H-LOS when compared to CCUS or both. POCUS had lower ED-LOS, TOR, and H-LOS when CCUS services were closed vs open. When closed, ED-LOS, TOR, & H-LOS were lower with POCUS than with CCUS or both. When CCUS was open all patients received both exams.

Conclusion: POCUS can diagnose and treat acute cholecystitis while helping to decrease the patient's time to disposition, time to OR, ED and hospital length of stay when compared with traditional approach with CCUS in patients with suspected acute cholecystitis. Routinely following POCUS with CCUS may delay care and constitute an unnecessary utilization of valuable resources.

529 Emergency Department Ultrasound Diagnosis of Bowel Obstruction

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Background: Patients with bowel obstruction often present with undifferentiated abdominal pain. The use of ultrasound (US) as a primary diagnostic modality for the identification of small bowel obstruction has been evaluated in a few small studies and has been shown to be more accurate than xray, which previous studies have shown to be diagnostic only 50-60% of the time

Objectives: To validate the results of previous studies in our setting, and to determine the test characteristics of emergency physician (EP) performed US.

Methods: The study is a prospective, observational study. Resident, fellow, and attending physicians with an interest in bowel US underwent a 30-minute training consisting of demonstration of the protocol and overview of images of normal and obstructed bowel. We enrolled adult patients presenting to the Emergency Department with 1.) symptoms suggestive of bowel obstruction, including abdominal pain, vomiting, and/or constipation, 2.) having the clinician's pretest probability of greater than very low probability of bowel obstruction, and 3.) plan to further imaging by abdominal computed tomography or abdominal radiographs to evaluate for bowel obstruction. The US examination consists of scanning through each of the four quadrants of the abdomen, identifying the most dilated loop of small bowel in each quadrant and measuring its diameter, and characterizing the degree of peristalsis. Bowel obstruction was defined as dilated loops of bowel >2.5 cm in diameter with to and fro peristalsis. The primary outcome is the diagnostic performance of EP-performed US of the abdomen, compared to a reference standard of CT scanning.

Results: 103 patients have been enrolled to date. Of these, 27 were ultimately diagnosed with small bowel obstruction (26%). EP-performed US demonstrated a sensitivity and specificity of 85% and 84% respectively, and a positive likelihood ratio and negative likelihood ratio of 5.4 and 0.18 respectively.

Conclusion: Emergency physician performed US for the diagnosis of small bowel obstruction has a sensitivity of 85%, which compares favorably to plain radiographs. US is a more sensitive screening tool than plain radiographs for bowel obstruction, and both a positive and a negative test result have a moderate effect on the pretest probability of bowel obstruction.

530 How Accurate Is Ultrasound in Diagnosing Pneumoperitoneum? A Meta-Analysis

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Background: Ultrasound has been investigated in the evaluation of patients with suspected pneumoperitoneum in emergency department (ED). The advantages of bedside ultrasound in the diagnosis of pneumoperitoneum include rapid availability, absence of radiation, ease of use, and reduced costs.

Objectives: To determine the diagnostic test characteristics of ultrasound for diagnosing pneumoperitoneum.

Methods: A systematic search of the English language literature published between 1966 and 2015 was performed. Search terms included pneumoperitoneum; intra-abdominal free air; intraperitoneal free air; ultrasonography; ultrasound; sonography. Articles were identified from MEDLINE search, bibliographies of reviews and original articles, and suggestions from experts in the area of ultrasound. The following inclusion criteria were used to select articles for this review: (1) the study reported as original research 2) ultrasound performed for diagnosing pneumoperitoneum. CT scan and surgical exploration were used as the criterion reference standards for the diagnosis of pneumoperitoneum. The methodologic quality of individual studies was evaluated for bias and study design using the QUADAS tool/ questionnaire. A hierarchical summary ROC curve (HSROC) analysis was then constructed using Stata v12.0 that allows both fixed and random effects for threshold and accuracy.

Results: A total of 6 studies were included in the final analysis. The total number of patients in these studies was 955. Three hundred patients were diagnosed with pneumoperitoneum. The pooled estimates for these 6 studies were 90% for sensitivity, (95% CI, 0.75 to 0.96) 96% for specificity (95% CI, 0.6 to 100%), 22.5 for the positive likelihood ratio (95% CI, 2.3 to 218.6]), 0.11 for the negative likelihood ratio (95% CI, 0.04 to 0.28), and 212 for the diagnostic odds ratio (95% CI, 18 to 2459).

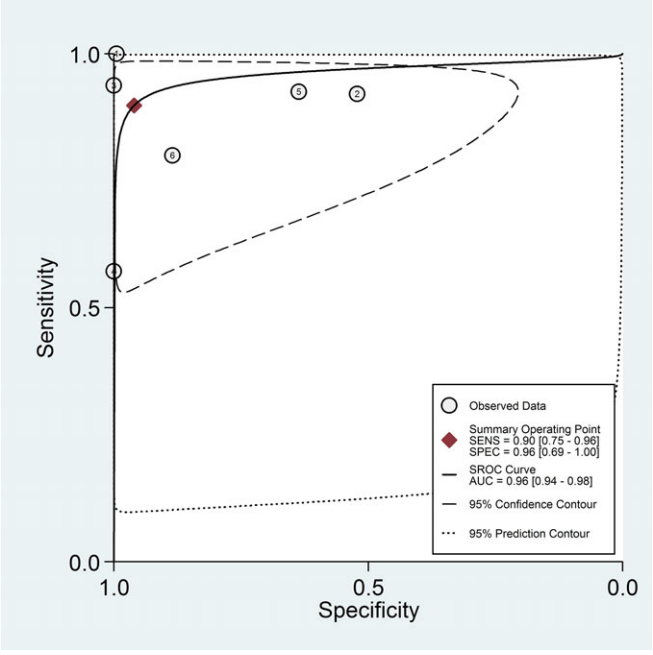

Figure 530 – Adhikari

The SROC curve for the diagnostic accuracy of ultrasound is shown in the Figure 1.

Conclusion: Ultrasound has high sensitivity and specificity in diagnosing pneumoperitoneum. It can be used as one of the diagnostic tools in the evaluation of ED patients with suspected pneumoperitoneum.

531 Grading Hydronephrosis: A Comparison of Accuracy Between Point-of-Care Sonographers at Various Levels of Training

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Background: Nephrolithiasis is a common pathology presenting to emergency departments. Studies have focused on evaluating the diagnostic process that emergency physicians use in order to identify and treat such patients. Ultrasound is safe and effective, and should be the initial imaging modality for patients with suspected nephrolithiasis.

Objectives: To determine how level of training of Emergency Physicians(EP) affect the diagnostic accuracy of identifying and grading hydronephrosis. In this study we assessed how accurately medical students(MS), emergency residents and ultrasound fellows from one academic medical center could identify different grades of hydronephrosis.

Methods: Subjects were given a brief presentation on hydronephrosis. Subjects then reviewed 42 independent renal ultrasound video clips and were given 30 seconds each to identify the grade of hydronephrosis visualized. Answers were recorded with only the subjects training level as an identifier. The grading of hydronephrosis of each level of medical training was compared to a gold standard (100% agreement between senior EP Ultrasound faculty). Accuracy as well as inter-relater reliability was evaluated.

Results: A total of 56 subjects, 24 students, 10 PGY-1, 9 PGY-2, 9 PGY-3 and 4 fellows participated. The average total number of correctly identified clips for MS, PGY-1, PGY-2, PGY-3 and fellows was 21.8 (52.1%), 24.8 (59%), 26 (61.9%), 23.5 (56.1%), and 30 (71.4%) respectively. There was a significant association between the overall score and level of training ($P < 0.0107$). Among residents and fellows, normal had the highest level of accuracy and there was a trend toward increasing accuracy for severe hydronephrosis. Inter-rater reliability was lowest among students and highest among participants with a training level at or above PGY-2.

Conclusion: The accuracy of identifying various grades of hydronephrosis increased with level of training. Participants were very good at recognizing both normal and severe hydronephrosis. While differentiating mild from moderate proved to be more difficult, this distinction is less important in the clinical arena. Using ultrasound to identify patients with suspected nephrolithiasis requires continued training of EP's to be proficient at grading hydronephrosis.

532 Follicular Debris in the Diagnosis of Ovarian Torsion: A Retrospective Review

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Background: Ovarian torsion is an emergent condition of partial or complete occlusion of the arterial and venous blood supply that could jeopardize the viability of the ovary. Absent color and spectral doppler flow to the ovary on ultrasound are signs that an ovary is torsed. Presence of flow does not rule out torsion. Despite the many potential sonographic indicators of torsion, it can still be difficult to diagnose. Several authors describe follicular fluid debris (FFD) as a "transudation of fluid and hemorrhage in the follicles of the torsed ovary [secondary to] circulatory impairment."

Objectives: This study set out to examine the presence of fluid debris in patients diagnosed with ovarian torsion. A secondary aim is to identify and correlate FFD to the presence of cysts, ovary size, and arterial resistive index (RI).

Methods: A retrospective chart review was done of all patients that presented to the ED at NY Methodist Hospital with the confirmed diagnosis of ovarian torsion from January 1, 2011 to July 1, 2015, who had an ultrasound available for review. RIs were obtained directly from the point of care ultrasound (POCUS) or comprehensive ultrasound (CUS).

Results: 56 had ovarian torsion and 48 ultrasounds reviewed for the presence of FFD in the torsed ovary. Of those 48, 21 had POCUS. all others had CUS. 63.8% (30) had FFD present in the affected ovary. Of those with FFD, 83.3% (25) had ovarian cysts. 40% (19) had RI calculated and 15% (7) of those had elevated RI; 29 had no RI due to lack of arterial flow or poor image quality.

Conclusion: The majority of the torsion patients demonstrated FFD, however the value of this is not yet clear. A larger study combining other findings of torsion with the presence of fluid debris should be conducted. Lastly, a larger retrospective or prospective study is required to evaluate the utility of the presence of FFD in POCUS.

533 Sensitivity of Aortic Outflow Tract Diameter Greater Than 4 cm for Type A Aortic Dissection on CT Angiogram

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Background: Ascending aortic dissections are associated with aortic dilatation. Aortic outflow tract dilatation can be detected by emergency physicians on point-of-care cardiac ultrasound which has been shown to agree with CT angiogram (CTA) measurements.

Objectives: We sought to determine the sensitivity of a dilated aortic outflow tract diameter of 4 cm or greater at the sinuses of Valsalva for the presence of a Stanford type A aortic dissection (TAD) on chest CTA.

Methods: We conducted a retrospective review of all Emergency Department ordered chest CTAs from the hospital Picture Archiving and Communication System for the period of July 1, 2009 to June 30, 2014 at a Level 1 Trauma Center. For each CTA, the diameter of the aortic outflow tract at the level of the sinuses of Valsalva was measured and the presence of a TAD was noted by one of six trained independent investigators. In addition, for all CTAs positive for dissection, a board certified attending radiologist blinded to the study hypothesis reported the location of the dissection, the diameter of the aorta at the sinuses of Valsalva, and also the maximum diameter of the aorta within 4cm distal to the sinuses of Valsalva. Sensitivity and specificity of aortic outflow tract dilatation at the sinuses of Valsalva for a TAD were calculated.

Results: From 4764 CTAs performed, we identified 13 type A dissections and 407 dilated aortic outflow tracts of 4 cm or greater. Of the 13 TADs, 3 had aortic outflow tracts measuring 4cm or greater. The sensitivity and specificity of a dilated aortic outflow tract of 4cm or greater for TAD at the sinuses of Valsalva were 23% (95%CI 6-54%) and 91% (95%CI 91-92%) respectively. Upon radiology review of these 13 cases, 8 TADs measured 4cm or greater within 4cm distal to the sinuses of Valsalva (Table 1).

Conclusion: A dilated aortic outflow tract of 4 cm or greater at the sinuses of Valsalva is not sensitive for TAD. However, with future research, dilatation of the aortic outflow tract distal to the sinuses of Valsalva may be more sensitive for this pathology

Table 1. Snyder: Radiology Review of the Thirteen Type A Dissection Cases

TAD Case	TAD at sinuses of Valsalva	TAD within 4cm of sinuses of Valsalva	Diameter of aorta at sinuses of Valsalva (cm)	Maximum diameter of aorta within 4cm distal to sinuses of Valsalva (cm)
1	Yes	Yes	3.2	2.9
2	No	Yes	3.2	4.3
3	No	Yes	3.9	3.0
4	No	No	3.0	2.4
5	No	Yes	3.7	3.9
6	Yes	Yes	3.6	3.5
7	No	Yes	3.5	4.8
8	Yes	Yes	4.4	5.0
9	Yes	Yes	4.5	6.2
10	Yes	Yes	3.4	4.5
11	No	Yes	3.9	4.6
12	No	Yes	3.7	4.5
13	Yes	Yes	4.2	5.9

534 Safety and Efficacy of the Easy IJ: A Novel Approach to Difficult IV Access

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Background: The Easy IJ involves placement of a 4.8cm 18-gauge single-lumen angiocatheter using ultrasound guidance in the internal jugular vein. This technique is employed in patients without suitable peripheral or external jugular venous access using either the standard palpation or ultrasound guided techniques. The safety and efficacy of this novel technique has not previously been established.

Objectives: We aimed to establish the efficacy of the Easy IJ in the ED setting by recording procedure times, failure rates, number of skin punctures, and patient reported pain scores. Additionally, we wanted to examine the safety of this new technique by tracking major complications, such as pneumothorax, bleeding, and infection.

Methods: We conducted a prospective study of the Easy IJ in stable ED patients with severe IV access difficulty. The study was conducted simultaneously at two academic EDs and a community affiliate ED. Emergency physicians prepped the skin and inserted the IV using the same technique as inserting an external jugular IV. Sterile gel lubricant was applied to an ultrasound probe covered with a bio-occlusive dressing. We collected the following data: patient body mass index, age, gender, procedure time (skin prep to securing line), pain score, success, number of skin punctures, occurrence of pneumothorax, occurrence of line infection (assessed by combination of patient follow-up and review of hospital records after leaving ED). We assessed delayed complications by phone follow-up or review of hospital records.

Results: We enrolled 77 patients, with a median age of 44 years (34-55, IQR) and median BMI 27.5 (23.4-32.0, IQR). Sixty-nine out of 77 (90%) attempts were successful with an average of 1.4 (SD ± 0.7) skin punctures per patient. The median duration for the procedure was 3 minutes (2-6, IQR). Average pain score was 4/10 (SD ± 2.5). There were no cases of pneumothorax or line infection. Fifty-four of the 69 (78%) initially successful lines remained patent at 24 hours.

Conclusion: The Easy IJ is a safe and efficient technique for securing IV access in patients whom otherwise would need central venous access.

Figure 534 – Moayedi

535 Does Choice of Resuscitative Fluids Impact Mortality and Renal Function in Septic Patients?

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Background: Balanced resuscitative fluids (BF) have been associated with decreased incidence of adverse renal outcomes in sepsis. We hypothesized that choice of resuscitative fluids would impact mortality in septic ED patients.

Objectives: Using a retrospective chart review, the objective of the current study was to detect an impact on both mortality and renal function associated with the type of resuscitative fluid used in septic patients.

Methods: This was a retrospective chart review of patients who presented with sepsis to a large, urban teaching hospital over 1 year. Inclusion criteria were adult ED patients with ICD-9 diagnoses of sepsis, septicemia, SIRS unspecified, and bacteremia. The intervention variable was the choice of resuscitation fluid in the first 2 days of hospitalization, defined as either normal saline (NS) or balanced fluids (BF; Lactated Ringer's, Isolyte, or PlasmaLyte). The primary study outcome was in-hospital mortality; secondary outcomes included (a) acute kidney injury (AKI defined by Cr > 3.96 or 2-fold rise), (b) hospital LOS (days), and (c) renal replacement (RRT). Assuming 20% fatality rate, we calculated the need to enroll 128 patients to detect a five-fold mortality difference with 80% power.

Results: Of 149 screened, 33 were excluded, leaving 115 for analysis, of whom 18 died (16% overall mortality). Mean age was 67 years; 54 patients were female; and the following comorbidities were most common: hypertension, diabetes, hyperlipidemia, dementia, and prior

stroke; 61 patients received BF +NS; 6 patients received BF only; 48 patients received NS only. Impact of resuscitative fluid choice on mortality is summarized in Table 1. Average length of stay was 9.2 days in those receiving exclusively BF and 6.9 days in those receiving exclusively CRF. BF-treated patients were more likely to have AKI (OR 6.3, CI 0.76-51.9).

Conclusion: We found that exclusively BF resuscitation was associated with reduction with in-hospital mortality risk. We were underpowered to show statistical significance in mortality and renal function, therefore further study is warranted.

Table 1. Owyang: Impact of Resuscitative Fluid Choice on In-Hospital Mortality for ED Patients with Sepsis

Treatment Group	N	Deaths	Mortality Rate (95% CI)	RR	95% CI
BF Only	6	0	0 (0-39)	0.54	0.03–8.55
BF + NS	61	12	19.7 (11.6-31.3)	1.57	0.64–3.89
NS Only	48	6	12.5 (5.9-24.7)	(reference)	(reference)

Abbreviations: BF= balanced fluids; CI= confidence interval; N= number; NS= normal saline; RR=relative risk

536 The Role of Rapid Bedside Clinic Pharmacy Consult in ED Sepsis Management

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Background: While optimal sepsis management has been redefined over the years, early administration and appropriate selection of antibiotics have remained critical interventions. Despite significant research and development of treatment protocols, severe sepsis and septic shock continue to pose high morbidity and mortality risks for ED patients.

Objectives: To examine the effect of a rapid bedside clinical pharmacy consult (CPC) versus the traditional physician-ordered antibiotics via protocols on appropriate selection, dosing, and time of antibiotic administration.

Methods: A sepsis alert pager was introduced as an option to provide a rapid CPC as part of an ED sepsis initiative. A chart review was performed after the start of this initiative over a seven-month period on patients with a final billing diagnosis of severe sepsis or septic shock. Cases were individually matched with controls based on initial lactate, time to diagnosis, and MEDS score. Appropriate antibiotic selection was determined using institutional recommendations based on the presenting infectious source and preexisting allergies. A two-sample t-test was used to analyze time to antibiotic administration and McNemar's test was used to analyze appropriate antibiotic selection and dosing.

Results: Initial lactate, time to diagnosis, MEDS score, age, and presence of fever, tachycardia, tachypnea, and hypotension were similar between the pharmacist and non-pharmacist groups. Bedside CPC showed an improvement in antibiotic dosing X^2 (1, N = 31) = 5.06, p= 0.024. There was no difference in time to antibiotic administration (32.4 (SD = 36.8) vs 34.9 minutes (SD = 44.4), $t(31) = -0.24$, $p = 0.81$) or for time to diagnosis onset (33.0 (SD = 77.4) vs 70.6 minutes (SD = 33.0), $t(31) = -1.45$, $p = 0.16$) in the pharmacist and non-pharmacist groups, respectively. No difference was found for appropriate antibiotic selection, X^2 (1, N = 31) = 0.09, p= 0.76.

Conclusion: Bedside CPC showed a significant improvement in the optimization of antibiotic dosing but was not shown to have an effect on antibiotic selection or time to antibiotic administration. The implementation of bedside CPC can help optimize sepsis management through optimal drug dosing, however further studies to identify other potential benefits of bedside CPC are warranted.

537 Dysfunctional HDL Predicts Poor Outcome in Patients with Severe Sepsis

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Background: High Density Lipoprotein (HDL) can be readily oxidized in acute and chronic inflammatory conditions, and then exhibit pro-inflammatory and dysfunctional (Dys-HDL) characteristics. Dys-HDL can be measured and quantitated using a cell-free assay (CFA), where CFA > 1 = Dys-HDL, and CFA < 1 = anti-inflammatory or functional HDL.

Objectives: To determine if change in CFA over the first 48 hours of admission for severe sepsis is predictive of adverse clinical outcome (death, discharge to hospice, or nursing home).

Methods: A prospective, observational cohort of patients presenting to the UF Health Jacksonville ED meeting criteria for severe sepsis were enrolled within 24 hours of sepsis recognition. Upon enrollment, serum samples were drawn for Dys-HDL testing, and repeat measures were obtained at 48 hours from enrollment to calculate change in CFA. A multivariate logistic regression model was created and receiver operator characteristic (ROC) curves were generated to assess the performance of delta CFA in predicting adverse outcome.

Results: 35 patients had complete measurements. CFA at either admission (r_s=-0.09, p =.55) or 48 hours (r_s=.29, p =.09) were poorly associated with an adverse outcome, whereas the change in CFA over the 48 hours was significantly associated with outcome by Spearman's correlation (r_s=.38, p = .022). Multivariable logistic regression identified delta CFA (OR 2.7, 1.1-6.6, p = 0.029) as a significant predictor of adverse outcome. Initial serum lactate level (OR 1.21, 95% CI 0.82-1.79, p = .324), initial shock index (0.21, OR 0.02-2.8, p = .24), age (OR 1.07, 95% CI 0.99-1.15, p = .073), gender (1.74, OR 0.26 - 11.6, p = 0.57), and active cancer (OR 1.82, 95% CI .178 - 18.7) were not significant predictors. ROC curves were generated with AUCs improving from 0.69 without delta CFA to 0.81 with delta CFA.

Conclusion: The change in CFA over the first 48 hours either alone or combined with clinical indices is highly predictive of adverse clinical outcomes in patients admitted for severe sepsis or septic shock.

538 The Effect of Patient and Provider Gender on Time to Antibiotics Among Patients with Severe Sepsis or Septic Shock

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Background: Physician gender may impact diagnostic and management practices in ED patients. Our previous work identified differences in time to antibiotics between women and men with severe sepsis or septic shock.

Objectives: Our objective was to investigate the impact of physician gender on the association between time to antibiotics and patient gender.

Methods: Patients > 18 years old admitted to a community hospital and Surviving Sepsis Campaign (SSC) site between 02/2011 and 07/2013 were eligible; those meeting criteria for severe sepsis or septic shock were included. Data on time to antibiotics from ED arrival, clinical characteristics including infectious source and illness severity (Sequential Organ Failure Assessment (SOFA) score), and gender of primary provider (attending or resident) were abstracted by SSC study staff and trained research assistants using standard abstraction forms. Logistic regression, stratified by provider gender, was used to test for effect modification of provider gender on the association between patient gender and antibiotic administration within 3 hours, first in

unadjusted analyses and then adjusted for age, race, insurance status, SOFA score, infectious source and mode of arrival.

Results: 807 patients were included; 46.2% (n=372) were female, and 11.4% (n=91) were nonwhite. Of the provider encounters, 38.1% (n=304) were female. Overall, 75.0% (n=279) of females vs. 77.8% (n=337) of males received antibiotics within 3 hours of arrival (p=0.35). Unadjusted, among patients with a female provider, men were 1.75 times more likely to receive antibiotics within 3 hours (95% CI 1.03-2.98); among patients with a male provider, men and women were equally likely to receive antibiotics (OR 0.89, 95%CI 0.58-1.35). After adjusting for SOFA score, age, race, infectious source, insurance status, and mode of arrival, male and female patients were equally likely to receive antibiotics within 3 hours of arrival among those with either a male (aOR 0.90, 95%CI 0.56-1.47) or female (aOR 1.36,95%CI 0.74-1.53) provider.

Conclusion: Antibiotic administration times were similar between male and female patients with severe sepsis or septic shock regardless of physician gender. Future research to elucidate the previously demonstrated differences in time to antibiotics based on patient gender should focus on patient specific and not provider specific factors.

539 Sepsis Alert Protocol Reduces Inpatient Mortality for Patients Presenting to the Emergency Department with Sepsis

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Background: Key interventions including intravenous fluids, timely antibiotics, and lactate monitoring are to known to improve outcomes in patients with severe sepsis.

Objectives: To determine the effect of a sepsis alert protocol on inpatient mortality for patients presenting to the ED with severe sepsis.

Methods: We designed a hospital-wide program, the sepsis alert protocol, for the recognition and early management of severe sepsis that includes timely antibiotics (within 3 hours of presentation), intravenous fluids (30 mL/kg), lactate monitoring, and blood cultures. The sepsis alert protocol went into effect on November 19, 2014 and we performed a before-and-after study of ED cases of severe sepsis to determine the effect of the program on inpatient mortality. Cases were identified via standardized sepsis diagnosis codes and extracted from the hospital EMR. We then determined if the sepsis alert protocol was implemented in each individual case. Groups (pre-protocol and post-protocol) were compared using the Pearson's Chi-square test for categorical data, and Wilcoxon rank sum tests for continuous data. Multiple logistic regression analysis was used to determine whether the implementation of the protocol was associated with inpatient mortality, controlling for gender, race (black, white, other), insurance (low-income, Medicare, private), age, Charlson Comorbidity Index, and the number of prior admissions.

Results: There were 153 (12.5%) inpatient deaths in the pre-protocol and 137 (9.5%) in the post-protocol. The multiple logistic regression revealed that the significant predictors of inpatient mortality were lack of implementation of the sepsis alert (p=.014), age (p<.0001), and the Charlson Index (p<.0001). The odds of inpatient death decreased by 27% after sepsis alert protocol implementation (OR=0.73, 95%CI 0.57, 0.94), controlling for patient's age and Charlson Index at last admission.

Conclusion: A timely, basic sepsis protocol significantly reduced odds of inpatient death for patients presenting to the ED with sepsis.

540 Bedside Measurement of Mitochondrial Dysfunction in Circulating Immune Cells in Sepsis

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Background: Mitochondrial dysfunction has been implicated in immune dysregulation and sepsis. Historically, testing mitochondrial function has been time-consuming and required painful biopsies. Recent advancement has allowed timely measurements of mitochondrial respiration that is minimally invasive.

Objectives: Our hypothesis is that timely measurement of mitochondrial respiration can be performed as a bedside test and that mitochondrial dysfunction occur in severe sepsis and septic shock.

Methods: This is a prospective observational study in a single site tertiary academic emergency department. We have enrolled 3 patients ≥18 years with severe sepsis or septic shock; 5 patients without sepsis or organ failure serving as controls. Citrated blood (8-mL) was collected within 1 hour of sepsis recognition. Only two hours were required for isolation of PBMCs and measurement of mitochondrial respiration. Basal, ATP-linked, and maximal mitochondrial oxygen consumption rates (in pmol/s/million cells) were measured in intact peripheral blood mononuclear cells (PBMCs) using high-resolution respirometry (Oroboros O2k). Spare respiratory capacity (SRC), an index of bioenergetic reserve available for cells under stress, was calculated as maximal minus basal respiration.

Results: Basal respiration and ATP-linked respiration were similar (p>0.05), and maximal respiration was significantly lower in sepsis (12, 9.1-14.2 vs 21, 17-24.2; p<0.05). Notably, SRC was significantly lower in sepsis (9, 6.1-12.1 vs 16, 13.2-15.1; p=0.03), which correlated with cases of severe sepsis and septic shock. All results was obtained within 2 hours from the time of blood draw.

Conclusion: The measurement of mitochondrial respiration can be performed as a bedside test with results available within a 2 hours. Mitochondrial dysfunction, detected by a depleted bioenergetic reserve (SRC), is present in the circulating immune cells of adults with severe sepsis and septic shock. In the future, the availability of a rapid bedside test for mitochondrial dysfunction combined with a measurable difference in patients with septic shock may make this a useful marker for the presence of septic shock in critically ill patients.

541 Hyperlactemia in Severe Sepsis and Septic Shock: Where is the Opportunity for Intervention?

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Background: Guidelines recommend a blood lactate (LA) ≥4.0 mmol/L threshold to initiate severe sepsis and septic shock (SS/SS) bundles. Less severe hyperlactemia has also been associated with mortality risk.

Objectives: Compare the impact of 3 hour bundle compliance on mortality, length of stay (LOS), and ICU LOS (ILOS) in ED SS/SS patients with LA <4.0 or ≥4.0 mmol/L.

Methods: Review of patients with SS/SS prospectively entered into a quality improvement database over 3.5 yrs. Setting: 4 urban, tertiary care, and 4 community hospitals in the NY metropolitan area. Bundle elements from TZero: 30 cc/kg IV fluid bolus ≤30 min, LA result ≤90 min, blood cultures drawn before antibiotics, IV antibiotics ≤180 min. Inclusion criteria: ≥2 SIRS + LA ≥2.2 mmol/L or sBP <90 or new organ dysfunction. Exclusion criteria: <18, advance directive precluding bundle, interventions declined. Mortality and LOS in Compliant (C) v Non-Compliant (NC) groups determined by log rank or chi square test.

Multiple logistic regression and Cox proportional hazards models assessed LA and bundle compliance (BC) as predictors of mortality and LOS, respectively.

Results: *BC:* LA <4.0 mmol/L: 3,798/13,189 (28.9%), LA ≥4.0 mmol/L: 1,267/4,263 (29.7%). Data presented as C v NC groups. Mortality: <4.0 mmol/L: 12.5% v 17.3%, (CI 3.1-6.7%); ≥4.0 mmol/L: 30.9% v 36.9%, (CI 1.7-10.3%), p<0.0001. *Median LOS:* <4.0 mmol/L: 8 (CI 9 10) v 9 days; ≥4.0 mmol/L: 9 (CI 9-10) v 11 (CI 11-12) days, p<0.0001. *Median ICU LOS:* <4.0 mmol/L: 4 v 5 (CI 4-5) days; ≥4.0 mmol/L: 4 (CI 3-4) v 4 days, p<0.0001. In adjusted regression models, interaction between LA and BC was not significant. LA ≥4.0mmol/L and noncompliance were associated with more than 2.5 mortality odds (odds ratio (OR) = 2.82, CI 1.25-1.57, p<0.0001) and a 40% increased mortality odds (OR = 1.40, CI 1.25-1.57, p<0.0001) respectively. LA <4.0mmol/L and BC were associated with 83% total LOS (HR^{-1} = 0.83, CI 0.79-0.89, p<0.0001) and 89% total LOS (HR^{-1} = 0.89, CI 0.85-0.93, p<0.0001).

Conclusion: 3 hour bundle compliance was associated with similar absolute risk reductions in mortality, LOS, and ILOS in SS/SS patients with LA <4.0 v ≥4.0 mmol/L, and did not show significant interaction in multivariable models. Current guidelines may not capture some patients who could benefit from sepsis bundle care.

542 Do Corrected Flow Time or Carotid Flow Volume Increase in Septic Patients Who Receive Fluid?

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Background: In septic patients IV fluid is given to improve tissue perfusion, however up to half of patients are not responsive to fluid. Fluid responsiveness, defined as an increase in cardiac output with a fluid bolus, can guide fluid administration. There is currently no simple and reliable method to determine if patients are fluid responders. Ultrasound Doppler methods of the carotid artery have been proposed to noninvasively assess fluid responsiveness, carotid flow volume (CFV) measures and corrected flow time (FTc), in place of transthoracic echo (TTE) which is technically challenging to perform.

Objectives: To determine if septic patients in the ED who are treated with 1 liter of IV fluid have a change in CFV, FTc or stroke volume (SV) based on TTE.

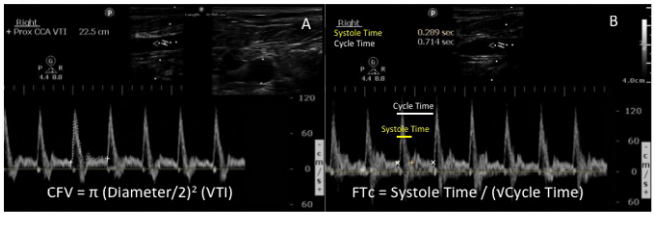
Methods: Two emergency physicians having completed over 150 TTE exams with training in TTE and carotid measures prospectively enrolled a convenience sample of septic patients age >18 years of age treated at one of 3 emergency departments. Vital signs and ultrasound measures were taken before and after fluid administration. Cardiac SV was calculated by TTE by velocity time integral (VTI) of aortic outflow in the apical long-axis view, with left ventricular outflow tract measured in the parasternal long axis. Carotid measures were calculated as FTc= ST/SQRT(CT), and CFV=3.14(carotid diameter/2)^2 (Carotid VTI)· T-test was performed to assess for changes after treatment.

Results: We enrolled and analyzed data for 53 septic patients. Of these, 3 patients were excluded for failure to complete fluid challenge and 7 were excluded, as TTE measures could not be performed, leaving 43 patients for analysis. Vital signs and ultrasound measures before and after fluids are provided (Table). Analysis showed significant changes for ultrasound measures of cardiac SV by VTI 73.9ml vs 86.3ml (p= 0.008) as well as CFV 10.2ml and 12.3ml (p< 0.001). There was no change in FTc after fluid administration 334 vs 338 (p=0.481).

Value	Pre-Fluid	Post-Fluid	p value
Heart Rate (bpm)	108 (16)	101 (15)	<0.001
Systolic BP (mmHg)	124 (25)	120 (20)	0.148
Respiratory Rate (per min)	22 (6)	21 (8)	0.346
Temperature (F)	101.4 (0.3)	100.3 (0.3)	0.001
Carotid Diameter (cm)	0.704 (0.1)	0.732 (.1)	0.012
Carotid VTI (cm)	26.7 (10.5)	29.9 (9.6)	0.006
Carotid Flow Volume (mL)	10.2 (0.6)	12.3 (0.6)	<0.001
Corrected Flow Time	334 (7)	338 (7)	0.481
Stroke Volume (mL)	73.9 (4.8)	86.3 (6.8)	0.008

Table 542: Pare.

Figure



A. In the upper right corner the diameter of the carotid artery is measured. The VTI is then obtained using pulsed wave Doppler. Using the formula the volume of blood per heart beat (CFV) delivered to the carotid artery is determined. B. FTc is determined by measuring the time from the upstroke of systole to the dicrotic notch (systole time). The cycle time is the beat to beat time. Using the formula the FTc is then calculated.

Figure 542 – Pare

Conclusion: Both cardiac stroke volume by VTI as well as CFV showed statistically significant increases after fluid administration. Corrected flow time did not have a significant change after fluid administration. CFV is a fast and simple measure that shows promise for a noninvasive point of care measurement of fluid responsiveness.

543 Comparing the Effectiveness of a Novel Suction Set-Up Using an Adult Endotracheal Tube Connected to a Meconium Aspirator vs. a Traditional Yankauer Suction Instrument

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Background: The Yankauer suction instrument (CONMED Corporation, Utica, NY, USA) has become the standard tool used by EM physicians when trying to control secretions, blood, and vomitus during emergent endotracheal intubation. As an alternative, Weingart and Bhagwam (J Clin Ane, 2011) described a novel set-up using an adult 8-0 endotracheal tube (ETT) connected to a neonatal meconium aspirator (Neotech Products, Inc., Valencia, CA, USA) for improved suctioning and simultaneous intubation.

Objectives: This study compares the effectiveness of a Yankauer versus an ETT-meconium aspirator set-up in suctioning liquids of different viscosities.

Methods: The Yankauer and ETT-meconium aspirator device underwent a head-to-head timed comparison, suctioning 250 ml of three different fluids, varying in viscosity. The first comparison used tap water to represent simple oral secretions. The second comparison used pig's blood as a proxy for human blood. The third comparison used a coarsely blended mixture of a hamburger, French fries, and a soda to simulate emesis. In each comparison test, five separate time trials were conducted for each of the two different suction devices. The time to suction 250 ml of each liquid was recorded, analyzed and compared between the two groups.

Results: The ETT-meconium aspirator device compared to the Yankauer suctioned faster in both the water comparison test (mean = 2.57 seconds vs. 3.39 seconds; p < 0.001) and the pig's blood comparison test (mean = 2.92 seconds vs. 4.25 seconds; p = 0.0015). As for the blended hamburger meal, the Yankauer immediately clogged in all 5 trials and no fluid reached the suction tubing. The ETT-meconium aspirator set-up managed to suction an average of 90 ml of the emesis-like mixture for each of the 5 trials before clogging. In addition, the blockage occurred at the level of the suction tubing distal to the apparatus. The ETT itself never clogged, accommodating all of the course matter contained in the mixture.

Conclusion: Compared to the Yankauer, an adult 8.0 ETT connected to a meconium aspirator was superior in suctioning liquids of varying

viscosities. When encountering a difficult airway due to copious secretions, blood or emesis, the ETT-meconium aspirator set-up should be considered.

544 Comparison of Two Cricothyrotomy Techniques in an Obese Sheep Model

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Background: Cricothyrotomy is a rare critical procedure that all emergency providers must be prepared to perform. The anatomy of a morbidly obese patient provides additional procedural challenges, as there is excess tissue and inability to palpate landmarks.

Objectives: The purpose of this study was to compare two cricothyrotomy techniques in an animal model simulating obesity.

Methods: Thirteen emergency medicine residents were randomized to perform one of two cricothyrotomy techniques on sheep: a standard technique (ST) using a Trousseau dilator and Shiley tracheal tube or a bougie-assisted technique (BAT) with an endotracheal tube. A 1:1 mixture of autologous blood and saline was injected anterior to the cricothyroid membrane to simulate morbid obesity. Just prior to the procedure, residents assigned to ST watched the New England Journal of Medicine video titled "Cricothyroidotomy"; those assigned to BAT watched a video published in Academic Emergency Medicine titled "Bougie-assisted cricothyrotomy technique." Total time to complete the procedure (from initial palpation of the neck until inflation of the tube balloon) was recorded.

Results: There were 7 residents in the ST group (mean PGY 2.4 years) and 6 residents in the BAT group (mean PGY 2.3 years). None of the residents had ever performed a cricothyrotomy on humans. A mean of 125 mL of blood and saline was injected into to the neck, with a mean cricothyroid membrane depth of 1.7cm (measured by ultrasound). One of 13 residents thought they could palpate landmarks. Mean (SD) time to perform cricothyrotomy took 167 seconds (75.8) in the ST group and 113 seconds (48.3) in the BAT group (difference = 54 s, 95% CI -24 to 133). There were no cases where the supervising faculty had to intervene to perform the procedure; one resident had to cross over from the ST to the BAT. On a 100-point visual analog scale, the perceived difficulties of the ST and BAT were 40 and 35, respectively (difference = 5, 95% CI -32 to 23).

Conclusion: Preliminary data reveals that the BAT was a faster method of performing cricothyrotomy on an obese sheep model, though this difference did not achieve statistical significance. A total of 20 residents will be enrolled to achieve 90% power. The perceived difficulty of the two techniques was similar.

545 Variation in Emergency Medicine Physician Opioid Analgesic Prescribing to Patients with Low Acuity Back Pain

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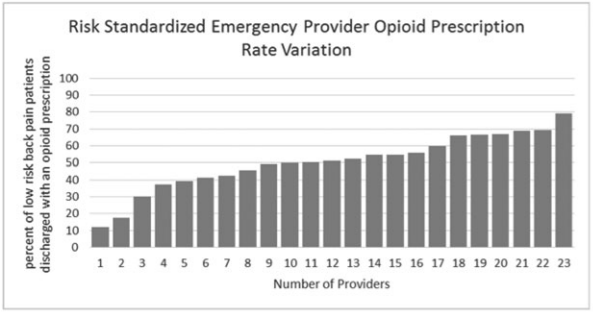
Background: Treating pain is essential to the practice of EM. Back pain is commonly treated with opioid analgesics; however, opioid prescribing practices are thought to be highly variable. Significant variability in care would suggest a lack of consensus and an opportunity to standardize and improve patient care.

Objectives: To evaluate variation in EM attending opioid prescribing rates to patients with low acuity back pain.

Methods: This retrospective study evaluated attending EM physician opioid prescribing to non-ambulance, adult ED patients with low acuity back pain discharged from an urban academic ED over 7-months (5/13-11/14). Low acuity back pain was defined as: (1) chief complaint of back pain, (2) discharged without any ED interventions, and (3) predefined back pain ICD 9 discharge diagnosis. Cases and prescribing data were abstracted from the electronic health record via computer algorithm. The main outcome was physician rate of opioid prescribing defined as: the percentage of low acuity back pain patients prescribed opioid analgesics at discharge. To adjust for patient characteristics we calculated a risk standardized physician opioid prescribing rate defined as: the ratio of observed to predicted number of opioid prescriptions per provider, which was then multiplied by the group's mean opioid prescribing rate.

Figure: Risk Standardized ED Attending Physician Opioid Prescribing Rates for Patients with Low Acuity Back Pain



This histogram illustrates the adjusted opioid prescription rates by EM attending physicians. These rates were adjusted for the patient's age, gender, race, insurance and EM physician total patient volume.

Figure 545 – Hoppe

Results: 1,857 patients had a chief complaint of back pain and were discharged with no ED interventions during the 7-month period; of these, 1,166 (63%) patients also had a final diagnosis of back pain. We excluded providers who had seen less than 25 patients with low acuity back pain during the study period, removing their patients resulted in a final cohort of 943 patients. The unadjusted variation in attending physician opioid prescribing rates ranged from 3.7% to 88.1%, resulting in a 22-fold variation. The mean unadjusted opioid prescribing rate was 58.4% (SD +/- 22.2). The adjusted opioid prescribing rates ranged from 12.0% to 78.2%, resulting in a 6-fold variation. The adjusted mean opioid prescribing rate was 50.4% (SD +/-16.4).

Conclusion: We found a six-fold variation in the adjusted rate of opioid analgesic prescribing within a cohort of similar ED patients with low acuity back pain, suggesting significant variation in opioid prescribing decisions amongst EM attending physicians.

546 Changing Opioid Prescribing Practices in an Urban ED

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Background: Opioid abuse is a public health problem that impacts EM providers. Prescribing polices and education are potential ways to address the crisis.

Objectives: This study assessed the opinion of EM providers on the prescription opioid crisis, the value of an opioid prescribing policy and their experience prescribing opioids at discharge before and after an educational program and implementation of an opioid prescribing policy.

Methods: A pre and post intervention survey was conducted at an urban, Level 1 Trauma center ED. All EM attendings, residents and physician assistants (PAs) were enrolled. A 12-question survey was administered in September 2012. An educational session was presented prior to the September 2013 rollout of an institutional opioid prescribing policy. Participants were resurveyed in June 2014. Responses from those who completed both surveys were analyzed.

Results: Sixty-six of 87 providers (76%) completed both surveys; 47% were attendings, 39% residents and 14% PAs. There were no significant differences post intervention in the following areas: recognition of the crisis, desire for a prescribing policy, number of pills dispensed, and use of electronic health records or state prescription monitoring program (MAPS) to screen for possible opioid abuse. The most frequent opioid prescribed remained hydrocodone. Significant changes were

detected as follows: provider access to MAPS increased from 48% to 82%, rarely or never refilling opioid prescriptions for chronic pain went from 39% to 77%, prescribing hydromorphone and oxycodone dropped from 21% to 3% and 42% to 30%, respectively. However, failure to use the state Department of Corrections Offender Search increased from 33% to 50%, 35% of providers sometimes frustrated with patient interactions increased to 48%, and there was a 44% drop in providers who felt an opioid policy would definitely help guide their practice.

Conclusion: Most EM providers were aware of the opioid abuse crisis and desired a policy addressing opioid prescribing. After an educational program and implementation of an opioid policy, more providers expressed frustration with patient interactions and fewer felt the policy was beneficial. Despite this, there was a decrease in ED refilling of opioids for chronic pain and in oxycodone and hydromorphone prescribing.

547 An Assessment of the Disposable CMAC System

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Background: Karl Storz recently developed a disposable (plastic) blade for its videolaryngoscopy system (CMAC).

Objectives: We sought to evaluate the quality of view between the disposable and reusable (metal) laryngoscopes in ED intubations.

Methods: We prospectively studied a convenience sample of adults (≥18 years) undergoing emergent intubation in a single academic ED over an 8-month period. Type of blade was at physician discretion. Intubator experience, indications for intubation and risk factors for difficult intubation were collected. The primary outcome was quality of view categorized as excellent or not. Secondary outcomes included airway view using the Cormack-Lehane (CL) classification and first pass success (FPS). Qualitative commentary was also recorded. We report descriptive statistics, 95% confidence intervals where appropriate, and a multivariate regression model to determine contribution of type of blade to quality of view.

Results: A total of 390 adult patients were intubated during the enrollment period. 150 patients (38%) were enrolled, and 4 were excluded for incomplete data. Among these, 34 (23%) were intubated using the disposable blades. The disposable and reusable cohorts were similar with respect to seniority of intubator, indication for intubation, and number of potential difficult features. An excellent view was found in 96/116 83% (95%CI75-89) of intubations with the reusable blade versus 19/34 56% (95%CI 38-73) using the disposable blade, difference 27% (95%CI 9-45%). Mean CL score for the reusable blade was 1.3 (95%CI 1.2-1.4) versus 1.6 (95%CI 1.2-1.9) with disposable. FPS was 103/116, 89% (95%CI 82-94) with the reusable blade and 27/34, 79% (95%CI62-91) with the disposable blade, difference 9%, (95%CI -5, 24%). Operators reported concerns related to blade width (impacting access to mouth, tongue sweep and loss of landscape on the video screen) in 9 (26%, 95%CI 13-44%). In a regression model controlling for patient and intubator characteristics, an excellent view was less likely when using a disposable blade (odds ratio =0.17, 95%CI 0.06-0.46).

Conclusion: The Karl Storz reusable blades are more likely to provide an excellent intubation view compared to the disposable blades. Further research is required to confirm that FPS is higher in the reusable blades.

548 Randomized Clinical Trial Comparing Amnesia and Adverse Respiratory Events Between Moderate and Deep Procedural Sedation with Propofol in the Emergency Department

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Background: Both moderate and deep procedural sedation are performed frequently in the ED, but the comparative efficacy and safety of these levels of sedations when used for similar procedures has not been well described.

Objectives: To determine the difference in procedural amnesia and adverse respiratory events (ARE) between patients assigned to receive moderate (MS) or deep (DS) procedural sedation.

Methods: This was a prospective, randomized, controlled trial of consenting adults undergoing procedural sedation with propofol from 3/5/15-10/29/15. The observer's assessment of alertness/sedation (OAAS) score, vital signs, propofol doses, and end tidal CO2 (ETCO2) were monitored continuously during the procedure and recorded every 30 seconds. To assess memory, a standardized image was shown every 30 seconds starting several minutes before the sedation until the end of sedation. Recall and recognition of the images was assessed 10 minutes after the end of the sedation. ARE was defined as any intervention by the treating physician with any of an SaO2 <92%, a change in ETCO2 >10 mm Hg, or absent ETCO2. Data were analyzed with description statistics and Wilcoxon rank sum tests.

Results: 43 subjects were enrolled, 20 to MS and 23 to DS. The median propofol dose (mg/kg) in the MS group was 1.5 mg (range 0.7 - 2.8, IQR 0.4) and was 1.8 (range 0.9-5.0, IQR 0.7) for DS. There was no difference in the median lowest OAAS achieved or the proportion of images recalled. The was no difference in the duration of the amnestic period for MS was 4.6 min (95% CI 3.0-5.8) and for DS was4.2 min (95% CI 2.2-6.2). The amnestic period began 0.95 min (95% CI 0.5-1.4) before the first dose of propofol for MS and 1.6 min (95% CI 0.6-2.5) for deep. AREs were observed in 11/20 in the MS group and 14/23 in the DS group. 6 subjects randomized to MS achieved DS by OAAS, and 7 randomized to MS achieved DS. AREs were observed in 6/18 that achieved moderate sedation, and 19/25 thosewith deep sedation. Image recall was 74.3% for those that achieved moderate sedation and 50.3% for those that achieved deep.

Conclusion: There was no difference in the rate of AREs or the duration of the amnestic period or retrograde amnesia between patients assigned to receive MS and DS. The actual achieved level was associated with larger differences in recall and AREs.

549 A Retrospective Evaluation of Rocuronium Versus Succinylcholine in Rapid Sequence Intubation of Trauma Patients: Does Choice Matter?

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Background: Rapid sequence intubation (RSI) is the mainstay process for securing the airway of trauma patients requiring a definitive airway. Debate exists in regards to the choice of paralytic that is used for this procedure as well as if there is any superiority.

Objectives: We sought to determine if there are any differences in peri-procedure characteristics and outcomes between the use of rocuronium (Roc) and succinylcholine (Sux) during RSI and if either is a superior choice.

Methods: A four year retrospective study was conducted at an urban, level I trauma center. All trauma patients requiring immediate definitive airway control were included. Electronic medical records were reviewed for patient demographics, oxygen saturation (both at induction and at tube placement), paralytic used, operator experience level, procedure characteristics and outcomes (including ED mortality and complications i.e. desaturation, tube misplacement, emesis) and need for bolus sedation within 1 hour of paralytic administration. Patients receiving Roc were compared to those who received Sux. Descriptive proportional statistics and t-testing was used to compare the two groups

Results: Over a four year period, 259 patients were included. Table 1 demonstrates the characteristics and outcomes of both groups. Both groups of patients demonstrated similar baseline characteristics (though ISS was higher in the Roc group, both were above 25 and so were severely injured). The succinylcholine group had higher oxygen saturations both at induction and at tube placement however, this

Paralytic Administered	Roc		Sux		
Patient Demographics	n=94	95 % CI	n=165	95 % CI	p-value
Age	38	(34.7 to 42.1)	37	(35.3 to 40.5)	0.81
Male (%)	92	(86.6 to 97.4)	94	(90.4 to 97.6)	0.31
Injury Severity Score	38	(34.3 to 43.5)	31	(28.8 to 34.2)	0.007
Glascow Coma Score	8.1	(7.1 to 9.1)	10	(9.6 to 11.17)	0.049
Penetrating (%)	39	(29.1 to 48.8)	37	(29.6 to 44.4)	0.34
Facial Trauma (%)	34	(24.4 to 43.5)	54	(46.4 to 61.3)	0.001
Pulmonary Injury (%)	22	(13.3 to 30.3)	24	(17.5 to 30.5)	0.07
Potassium Level (mmol/L)	4.2	(1.8 to 6.6)	4.1	(2.9 to 5.3)	0.54
Oxygenation					
O2 (Induction)	95	(93.3 to 96.6)	98	(97.6 to 98.4)	0.003
O2 (Placement)	87	(81.7 to 92.3)	95	(92.3 to 97.7)	0.03
Operator Training Level					
EM/Anesthesia Attending (%)	29	(19.8 to 38.1)	34	(26.7 to 41.2)	0.41
EM Resident-4	9	(3.2 to 14.8)	5	(1.7 to 8.3)	0.2
EM Resident-3	21	(12.7 to 29.3)	18	(12.2 to 23.8)	0.55
EM Resident-2	22	(13.6 to 30.4)	21	(14.8 to 27.2)	0.94
EM Resident-1	19	(11.1 to 26.9)	22	(15.7 to 28.3)	0.55
Procedure Characteristics					
Video Laryngoscopy (%)	11	(4.7 to 17.3)	3	(0.4 to 5.6)	0.04
Multiple attempts (%)	7.4	(2.1 to 12.7)	17.1	(11.3 to 22.2)	0.02
Sedative Bolus Re-dosing (%)	23	(17.3 to 28.7)	36	(28.7 to 43.3)	0.01
Outcomes					
Documented Arrhythmia (%)	1.06	-	1.22	-	-
Complications (%)	6.3	(1.4 to 10.1)	16.4	(10.8 to 22)	0.01
Surgical Airway (%)	1	-	0	-	-
Unplanned extubation (%)	0	-	2	-	-
ED Mortality (%)	13	(6.2 to 19.8)	3	(0.4 to 5.6)	0.001

Table 549: Caputo.

group had higher rates of multiple attempts, sedative bolus dosing on top of analgesia drips and procedural complications. The Roc group had an overall higher ED mortality rate.

Conclusion: This study suggests that though Roc may be superior for the technical procedure of RSI, peri-procedural oxygenation was still lower and ED mortality was significantly higher in those patients that received it for airway management. A randomized control trial comparing paralytics used during RSI in trauma patients is needed to confirm or refute these findings.

550 Is Presence of Pain 1 Week After an ED Visit for Acute Low Back Pain Associated with Unfavorable Longterm Outcomes?

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Background: Nearly 25% of ED patients with acute, new onset, low back pain (LBP) report functionally impairing LBP 3months later. These patients are at risk of chronic LBP, a debilitating illness. Socio-demographic, psychosomatic, history, and physical exam features fail to predict poor outcomes among ED patients with acute, new onset LBP

Objectives: To determine if poor LBP outcomes at 3months can be predicted by persistence of LBP symptoms 1week after an ED visit

Methods: As part of a comparative effectiveness study conducted in one ED, we randomized 323 patients to a 10 day supply of naproxen + placebo, oxycodone/APAP,or cyclobenzaprine. Patients were followed by phone 1week and 3months post-ED visit. The randomized study, which enrolled 323 patients, was a negative study showing no advantage of the combinations over naproxen alone. We analyzed 2 complementary 3month outcomes: 1) the presence of moderate/severe LBP; 2) a score >5 on the RMDQ, a validated LBP research instrument. For each of these outcomes, we determined whether the presence of LBP 1week after the ED visit was associated with poor 3 month outcomes. Results are presented as ORs with 95%CI

Results: Of 323 randomized patients, 311 patients provided pain scores 1 week after the ED visit. Of these, 205 (66%, 95%CI: 60-71%) reported any pain. 295 patients provided 3month data on pain intensity; 294 provided an RMDQ score. 63 (21%, 95%CI: 17-26%) reported moderate/severe pain at 3months. 69 (23%, 95%CI: 19-29%) reported an RMDQ score >5. Of 102 patients without pain at 1week, 9 (9%, 95%CI: 5-16%) had moderate/severe pain at 3months, while 54 (28%, 95%CI: 22-35%) of the 193 patients who had pain at 1 week reported moderate/severe pain at 3months (OR: 4.0, 95%CI: 1.9, 8.5). Similarly, 11 (11%, 95%CI: 6, 18%) patients without pain at 1week reported 3month RMDQ scores >5, versus 58 (30%, 95%CI: 24-37%) patients who had pain at 1week (OR: 3.5, 95%CI: 1.8, 7.1)

Conclusion: The presence of pain 1week after an ED visit for acute LBP is associated with unfavorable 3 month outcomes. These data raise the possibility that if LBP can be controlled during the first week after an ED visit, the transition to chronic LBP may be preventable

551 Accuracy of Acute Kidney Injury Measurements in Multi-Stage Ultramarathon Runners

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Background: Acute Kidney Injury (AKI) is a common occurrence in endurance runners. Current practice to diagnose AKI when baseline serum values are unavailable is to use an age-based estimation of glomerular filtration rate (GFR) and the Modification of Diet in Renal Disease (MDRD) equation for back-calculation of baseline creatinine (Cr). However, the accuracy of this in a cohort of healthy runners is unknown.

Objectives: Evaluate the accuracy of the age-based GFR and MDRD equation in ultramarathon runners versus a candidate healthy population GFR equation.

Methods: A multi-site prospective analysis from participants of the 155 mile (250km) Racing The Planet multi-stage ultramarathons in the Sahara, Gobi, and Atacama Deserts. Baseline Cr measurements were taken prior to race start and compared to estimated Cr by the MDRD equation and age-based GFR.

Results: Forty-eight study participants (27% female, age 39.3 ± 10.3 years) were analyzed with all racers combined as a single cohort. Estimated baseline GFR was 95.9 (± 5.8) and Cr was 0.88 (± 0.1) by MDRD. Measured Cr was 0.99 (± 0.2) at race start and significantly different then estimated ($p < 0.001$), with a true baseline GFR via the MDRDequation of 86.1 (± 14.6) and a candidate healthy population equation of 107.1 (± 9.3). MDRD based GFR was 10% lower than estimated GFR ($p < 0.001$) and the healthy population GFR equation was 12% higher ($p < 0.001$). Correlation between estimated baseline GFR and MDRD based GFR was low ($r = 0.1$), with a higher correlation found between estimated baseline GFR and the healthy population GFR equation ($r = 0.43$).

Conclusion: Use of the accepted age-based GFR and MDRD equations results in an estimation of baseline renal function with a lower Cr than reality, leading to an over-estimation of subsequent AKI in ultramarathon runners. Future studies should consider utilizing the healthy population GFR equation for a more accurate estimation of AKI.

552 A Novel Adsorbent System Rapidly Clears Verapamil From Human Blood

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Background: Calcium channel blockers are not effectively removed by current extracorporeal removal techniques, such as hemodialysis or charcoal hemoperfusion. CytoSorb is a perfusion cartridge containing a novel sorbent polymer, approved and marketed in Europe for the removal of excess cytokines in sepsis.

Objectives: To determine whether a cartridge containing polymeric beads can efficiently clear verapamil from human blood.

Methods: 10 mg verapamil was added to 4 liters of citrate-anticoagulated whole human blood and stirred to equilibrate. This blood was then recirculated through a Cole-Parmer Masterflex L/S Digital Drive blood circuit at a rate of 300 mL/minute. In the experimental arm, a saline-primed 300-mL CytoSorb cartridge was installed in-line with the circuit. Whole blood samples were obtained prior to verapamil instillation, following equilibration, and after 0, 15, 30, 60, 120, and 180 minutes of blood recirculation. Whole blood verapamil concentrations were determined using previously-validated ultra performance liquid chromatography methods. The lower level of quantification (LLQ) was 0.25 mg/L whole blood. Two experimental and two control runs were performed.

Results: All quality control checks were within 15% of their respective nominal values. At the start of recirculation, whole blood verapamil concentrations were 2.50 (+/- 0.09) mg/L in the experimental and 2.23 (+/- 0.31) mg/L in the control arms. In the experimental arm, verapamil concentrations were 0.87 (+/- 0.001) mg/L at 15 minutes, 0.31 (+/- 0.04) mg/L at 30 minutes, and below LLQ thereafter. Verapamil removal was therefore 65.1% after 15 minutes of perfusion, 87.4% after 30 minutes, and 90% or greater at 60, 120, and 180 minutes. Verapamil concentrations in the control arm decreased 10.5% from baseline at 180 minutes.

Conclusion: Perfusion over polymer beads efficiently removes verapamil from whole human blood.

553 Systematic Review and Meta-Analysis of Clinical Factors Predictive of Severe Snake Envenomation in North and South America

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Background: Snakebite severity may range from a dry bite to severe envenomation and death. Clinical examination can aid in prognosis and is essential in weighing the risks and potential benefits of antivenom treatment.

Objectives: To identify historical features, physical examination, and laboratory testing that can differentiate patients with severe versus non-severe venomous snakebite in North and South America.

Methods: We conducted a structured search of MEDLINE (1966-Jan 2015) and EMBASE (1980-Jan 2015) to identify English-language studies that evaluated clinical factors predictive of severe envenomation. We included studies that evaluated the test performance of at least 1 clinical finding with an acceptable reference standard of severe envenomation. This included only studies of venomous snakes in the Western Hemisphere, as the clinical presentations of snake species globally vary widely. Two authors performed the critical appraisal, selection, and data abstraction. The methodologic quality of each article was determined using QUADAS 2 criteria with disagreements resolved through abstractor discussion and review. We calculated likelihood ratios (LR) and estimated combined LR with random effects models for predictors in multiple studies.

Results: Our search strategy yielded 1620 articles for review. Seventeen met our inclusion criteria and all involved the snake sub-family Crotalinae. The combined prevalence of severe envenomation across studies was 11.1%. Patient age < 12 years (LR range 3.0-3.4), large snake size (LR 2.4 95%CI 1.9, 3.0), time to treatment ≥ 6 hours (LR 2.7 95%CI 1.6, 4.6), ptosis (LR range 3.1-6.6), thrombocytopenia (LR 4.0 95%CI 2.9, 7.9) and hypofibrinogenemia (LR 5.6 95%CI 1.8, 17.4) increased the likelihood of severe envenomation. Envenomation by a non-large snake (LR 0.33 95%CI 0.18, 0.63) decreased the likelihood of severe envenomation. Normal prothrombin time (LR 0.07; 95%CI 0.004, 1.02) and d-dimer (LR 0.07; 95%CI 0.005,1.14) did not reliably exclude severe envenomation.

Conclusion: Although there are clinical features that identify patients at increased risk, there are few features than can confidently exclude severe envenomation. Physicians should be wary of progression and have a low threshold to monitor and escalate therapy as needed.

554 Measurement of Mitochondrial Respiration as a Biomarker in Carbon Monoxide Poisoning

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Background: Mitochondrial dysfunction occurs in many disease states of acute care such as trauma and sepsis. Recent advancement has allowed timely measurements of mitochondrial respiration in a variety of cell types that is minimally invasive. The measurement of mitochondrial function has significant potential with acute toxicological poisoning such as carbon monoxide exposure.

Objectives: This study was conducted to investigate whether there is a change in mitochondrial respiration in carbon monoxide poisoning and, if so, the clinical relevance with use as a biomarker.

Methods: This is a prospective observational study in a single site tertiary academic emergency department with a hyperbaric chamber to compare the measurement of mitochondrial respiration in 10 patients poisoned with carbon monoxide (complex IV inhibitor) with 10 control patients at the time of presentation to the emergency department. Citrated blood (8-mL) was collected within 1 hour of presentation. Only two hours were required for isolation of peripheral blood mononuclear cells (PBMCs) and measurement of mitochondrial respiration. Primary mitochondria respiration parameters were obtained in intact (PBMCs) using high-resolution respirometry (Oroboros O2k): Basal, ATP-linked, and maximal mitochondrial oxygen consumption rates (in pmol/s/million cells). In addition, blood carboxyhemoglobin and lactate levels were analyzed.

Results: Key mitochondrial respiration parameters such as basal and maximal respiration with carbon monoxide poisoning were lower than those of controls ($p>0.05$). In the CO group, however, there was no correlation between mitochondrial respiration and carboxyhemoglobin levels ($r = -0.344$, $P > 0.05$).

Conclusion: Results from this preliminary study suggest that the measurement of mitochondrial respiration might have diagnostic value in carbon monoxide poisoning and may be a better reflection of CO poisoning when compared to carboxyhemoglobin. In the future, the availability of this rapid bedside test for mitochondrial dysfunction combined with a measurable difference in patients with carbon monoxide poisoning can be used for prognosis and response to treatment (HBO).

555 A Comparison of Older Adults with Low-Risk and High-Risk Alcohol Use in the Emergency Department

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Background: Alcohol misuse is a common but under-recognized problem among older adults and can increase the risk of vehicle collisions, falls, and chronic medical problems. Emergency Department (ED) visits provide an important clinical setting for identifying high-risk alcohol use among older adults. Little is known about the epidemiology of this problem or the performance of screening instruments in this setting. We sought to estimate the prevalence of high-risk drinking among older adults receiving care in a U.S. ED, characterize high-risk drinkers, and assess the accuracy of two widely-used screening tools for detecting high-risk alcohol use.

Objectives: We sought to estimate the prevalence of high-risk drinking among older adults receiving care in a U.S. ED, characterize high-risk drinkers, and assess the accuracy of two widely-used screening tools for detecting high-risk alcohol use.

Methods: We conducted a cross-sectional study of cognitively intact adults aged 65 and older presenting to an academic ED serving a racially and socioeconomically diverse population. High-risk drinkers were identified using a 2-question screener to define whether intake was greater than the National Institute on Alcoholism and Alcohol Abuse (NIAAA) guidelines for older adults: >7 drinks per week OR >3 per occasion. All others were considered low-risk. Intake was verified using the timeline follow-back method. Characteristics of high-risk and low-risk individuals were compared. The sensitivity and specificity of the Alcohol Use Disorders Identification Test (AUDIT) and CAGE score were calculated using consumption above NIAAA guidelines as the criterion standard.

Results: 960 older adults presenting to the ED were screened. 99 (10.3%) met criteria for high-risk alcohol use, of which 56 were enrolled. 124 low-risk individuals were enrolled for comparison. Comparing high-risk and low-risk individuals the median ages were 71 and 74, 64% and 34% were male, and median numbers of drinks per week were 18 and 1 respectively. The number of recent falls and hospitalizations was similar in the two groups. With a cutoff ≥8, the AUDIT had a sensitivity of 36% and specificity of 98% to detect high-risk alcohol use by NIAAA criteria. A CAGE score ≥2 had sensitivity of 29% and specificity of 99%.

Conclusion: High-risk alcohol use is prevalent among older adults in the ED, and more common among men. A 2-question screener based on the NIAAA criteria can efficiently identify high-risk alcohol use. The AUDIT and CAGE scores had poor sensitivity for detecting high-risk alcohol use in this population.

556 Delirium's Arousal Subtypes and Their Effect on 6-Month Functional Status and Cognition

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Background: Delirium is heterogeneous, but the impact of its heterogeneity is unknown.

Objectives: We sought to determine how delirium subtyped by arousal affected 6-month functional status and cognition.

Methods: This prospective cohort study enrolled all delirious and a random selection of non-delirious emergency department (ED) patients who were ≥65 years old and admitted to the hospital. Delirium and arousal were ascertained in the ED and throughout hospitalization using the Brief Confusion Assessment Method and Richmond Agitation Sedation Scale, respectively. For each ED and hospital day, patients were categorized as having no delirium, delirium with normal arousal, delirium with decreased arousal, or delirium with increased arousal. Premorbid and 6-month functional status were determined using the Older American Resources and Services activities of daily living (OARS ADL) scale which ranges from 0 (completely dependent) to 28 (completely independent). Premorbid and 6-month cognition were determined using the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) which ranges from 1 to 5 (severe cognitive impairment). Multiple linear regression was performed to determine if delirium arousal subtypes were associated with 6-month function and cognition adjusted for premorbid OARS ADL or IQCODE, age, comorbidity burden, severity of illness, nursing home residence, and CNS diagnosis.

Results: A total of 159 patients were enrolled. The median (IQR) age was 73 (68, 81) years old and 68 (43%) were delirious in the ED. The relationship between the # of days spent in each delirium arousal subtype and 6-month function and cognition can be seen in Table. Delirium with normal arousal was significantly associated with poorer 6-month function and cognition. Delirium with decreased arousal was marginally significant for 6-month functional status only. Delirium with increased arousal was not significantly associated with either outcome.

Conclusion: The only delirium subtype that was significantly associated with both worsening 6-month functional status and cognition was delirium with normal arousal. This suggests that subtyping delirium by arousal may have prognostic value and may identify a subgroup at higher risk for adverse outcome who would most from an intervention.

Outcome	Delirium arousal subtypes days	β-coefficient (95%CI)
6-month functional status	Delirium with normal arousal	-0.80 (-1.53 to -0.07)
	Delirium with decreased arousal	-0.66 (-1.34 to -0.02)
	Delirium with increased arousal	0.34 (-1.62 to 2.30)
	No delirium	Reference
6-month cognition	Delirium with normal arousal	0.15 (0.07 to 0.24)
	Delirium with decreased arousal	-0.26 (-0.10 to 0.05)
	Delirium with increased arousal	0.01 (-0.21 to 0.21)
	No delirium	Reference

Table. Multivariable linear regression models evaluating the effect of delirium arousal subtype days on 6-month functional status and cognition.

Table 556: Han.

557 Variation in Physician Level Admission Rates for ED Patients Presenting with Chest Pain

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Background: Chest pain is a common ED presentation accounting for 8-10 million US visits per year. Physician level factors such as risk tolerance are predictive of admission rates. The recent advent of accelerated diagnostic pathways and ED observation units may have an impact in reducing variation in admission rates on the individual physician level.

Objectives: To determine if chest pain admission variation exists between physicians after controlling for appropriate patient and hospital level factors.

Methods: This was a single institution observational study at an academic tertiary care facility evaluating admission rates by physician for patients presenting with chest pain. Our ED has a dedicated observation unit that is commonly used for chest pain evaluation. We considered patients placed in observation status (either in the ED or medical floor) to be admissions. A total of 4,629 ED visits were studied over a two-year time period via review of hospital databases. Patients with elevated troponin (T≥0.01 ng/ml) or STEMI were excluded. Thirty-nine attending physicians achieved the minimum of 30 patients required for inclusion. We controlled for patient and hospital level factors including age, gender, race, insurance status, daily ED volume, and lab values.

Results: Median number of ED visits per physician was 132 (IQ range 89-172). Average admission rate was 73.7±9.5% ranging from 54% to 96%. Over half of admissions (60.8%) were to observation. Even

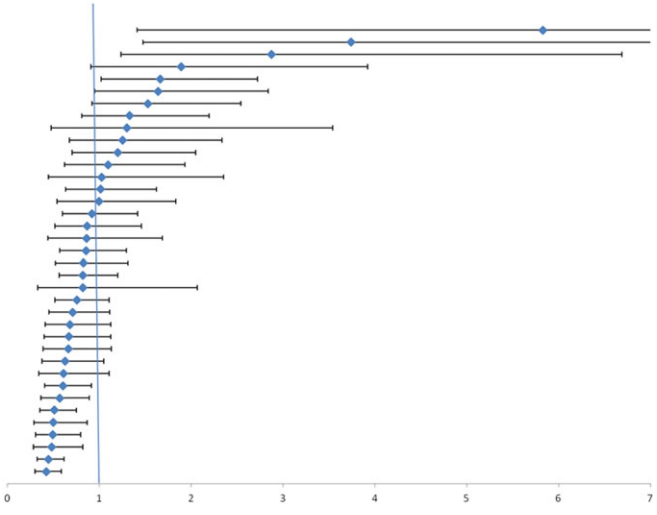

Figure 557 – Hall

after controlling for the potential confounders, significant variation remained in admission rate at the individual physician level with adjusted OR ranging from 0.42 to 5.8 as compared to the average admission rate. Patient age, gender, and blood glucose levels predicted higher admission rate whereas race and daily ED volume were not predictive of higher rates of admission.

Conclusion: There is wide variation in individual physician admission rates for patients presenting with chest pain even after controlling for potential confounders. Our overall high admission rates are related to high utilization of ED observation. Next steps include elucidating which physician characteristics predict higher rates of admission and how novel chest pain pathways modify both the variation in and overall high levels of admission.

558 Effects of Race and Socioeconomic Factors on Emergency Department Management of Threatened Abortion

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Background: Among women presenting with complications in pregnancy, demographically-based differences in incidence, outcomes, and treatment are well known. However, it is unclear whether socioeconomic variables affect the management of threatened abortion.

Objectives: To determine the effects of race, insurance, and hospital characteristics on the management of threatened abortion.

Methods: Patient record files from the National Hospital Ambulatory Medical Care Survey with a diagnosis of threatened abortion, hemorrhage in pregnancy, or incomplete or unspecified spontaneous abortion from 2002-2010 were examined using logistic regression. Primary outcomes were rates of admission and active management, defined as surgical or medical treatment. Covariates included race/ethnicity, age, insurance, and hospital location, ownership, and metropolitan status.

Results: Of 5,882,623 ED visits for threatened abortion, 15% were admitted and 1.3% were actively managed. Compared to white women, black women were less likely to be admitted (OR 0.83, 95% CI 0.83-0.84), but more likely be actively managed (OR 4.37, 95% CI 4.25-4.50). Admission was more likely for "Other" women, including Asian, mixed race, and American, Hawaiian, Alaskan Natives (OR 2.14, 95% CI 2.11-2.17), as well as Medicaid/SCHIP (OR 1.24, 95% CI 1.22-1.25) and Self-pay (OR 1.04, 95% 1.03-1.05). Historically-marginalized groups, including uninsured, black, and "Other" women, were more likely to be actively managed. Exceptions were Latinas (OR 0.84, 95% CI 0.80-0.89) and Medicaid/SCHIP-insured (OR 0.13, 95% CI 0.12-0.15). Hospitals outside of the northeast were less likely to admit or actively manage women. Nonwhite women were less likely to be treated for pain, especially Latinas (OR 0.29, 95% CI 0.28-0.29).

Conclusion: Compared to white women, black women are less likely to be admitted for threatened abortion, but more likely to be actively managed. Other nonwhite and uninsured women are more likely to be admitted and actively managed, excepting Latinas. Nonwhite women are less likely to receive pain treatment. The etiology of these disparities is complex, but providers may seek to better understand their own preconceptions of patient compliance or risk, and to improve social support, communication, and shared decision-making.

559 Performance of the HEART Pathway with High Sensitivity Versus Contemporary Troponin Assays

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Background: The HEART Pathway combines a decision aid and serial contemporary cardiac troponin (cTn) measures to achieve >99% sensitivity for major adverse cardiac events (MACE) at 30 days and early discharge rates >20%. However, the impact of integrating high-sensitivity troponin (hs-cTn) measures into the HEART Pathway has yet to be determined.

Objectives: To determine the test characteristics of the HEART Pathway using hs-cTnI compared to cTnI.

Methods: A secondary analysis of 141 participants randomized to the HEART Pathway arm of the HEART Pathway RCT was conducted. Emergency Department (ED) patients ≥ 21 years old with symptoms suggestive of ACS were enrolled. Each patient was risk stratified by the cTn-HEART Pathway (Siemens TnI-Ultra at 0- and 3-hours; 99th percentile upper reference limit [URL]: 0.040 μg/L) and the hs-cTn-HEART Pathway (hs-cTnI [Abbott] measured at 3-hours, using gender URLs [male: 34 ng/L; female: 16 ng/L]). The early discharge rate, sensitivity, specificity, and negative predictive value (NPV) for MACE (cardiac death, myocardial infarction [MI], or coronary revascularization) at 30 days were calculated.

Results: hs-cTnI measures were available on 133/141 patients. MACE occurred in 8/133 (6%) of these patients (7 MIs, 1 revascularization). Test characteristics for the HEART Pathway using serial cTnI vs 3 hour hs-cTnI were the same: sensitivity (100%, 95%CI: 63-100%), specificity (48%, 95%CI: 39-57%), NPV (100%, 95%CI: 93-100%), and early discharge rate (45%, 95%CI: 37-54%). Sensitivity using hs-cTnI alone (without the HEART Pathway) was 75% (95% CI 40-94%) compared to 50% (95% CI 22-78%) for initial cTnI and 71% (95% CI 35-92%) for 3 hour cTnI.

Conclusion: There was no difference in sensitivity, specificity, NPV, or early discharge rate using the HEART Pathway whether cTnI or hs-cTnI was used. When used alone, without the HEART Pathway, hs-cTnI and cTnI measures had low sensitivity for MACE.

560 Factors Associated with Guideline Discordant Antibiotic Prescribing for Emergency Department Cutaneous Abscesses

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Background: Guidelines recommend that most abscesses be treated by incision and drainage (I&D) alone. However, over 85% of

patients discharged from the ED nationwide receive antibiotics after I&D. Overuse leads to increasing bacterial resistance, as evidenced by the rising epidemic of community-acquired methicillin-resistant Staphylococcus aureus.

Objectives: The primary objective of this study was to identify factors associated with ED provider decisions to prescribe antibiotics following I&D of a superficial cutaneous abscess in order to promote greater adherence to guidelines and minimize overuse. A secondary objective was to identify factors associated with treatment failures at 7- and 10-days.

Methods: This retrospective review evaluated patients discharged from the ED with a procedure note for I&D over a 6-month period. Exclusions are detailed in figure 1. They were divided into two groups stratified by receipt of a prescription for antibiotics or not. Charts were evaluated for presence of associated cellulitis, systemic symptoms, relevant co-morbidities (i.e. diabetes, HIV, etc), and treatment failure at 7 and 10 days (defined as evidence of recurrence or change in abscess management) determined by documentation of return ED visit. Odds Ratios for receiving antibiotics and Relative Risks for treatment failure were calculated with Confidence Intervals.

Results: Of 268 patients, 204 (76%) received a prescription for antibiotics and 57% of those patients received a dose of antibiotics in the ED, including 18% intravenously. Patients with associated cellulitis and relevant co-morbidities were significantly more likely to be prescribed antibiotics. Patients who did not receive a prescription for antibiotics were not at higher risk for treatment failure (table 1).

Conclusion: Failure rates were low, and prescribing antibiotics did not reduce failure rates. Providers were more likely to give antibiotics for any associated cellulitis or relevant co-morbidities. Aligning antibiotic prescribing after I&D with guidelines should not increase treatment failures and could reduce medical costs. Understanding the concerns and rationale behind provider decision-making is the first step towards addressing discrepancies between practices and guidelines.

Odds Ratios and Relative Risks

	Odds Ratio	95% CI
Associated Cellulitis	11.7	2.8 - 49.6
Systemic Symptoms	3.7	0.9 - 16.4
Relevant Co-morbidities	2.7	1.3 - 5.6
- IV Drug Use	4.7	1.1 - 20.5
- Diabetes Mellitus	2.1	0.9 - 5.3
- Hepatitis	1.8	0.4 - 8.2
	Relative Risk	
Failure at 7-days	1.06	0.22 - 5.14
Failure at 10-days	1.82	0.55 - 6.02

Table 560: Willman.

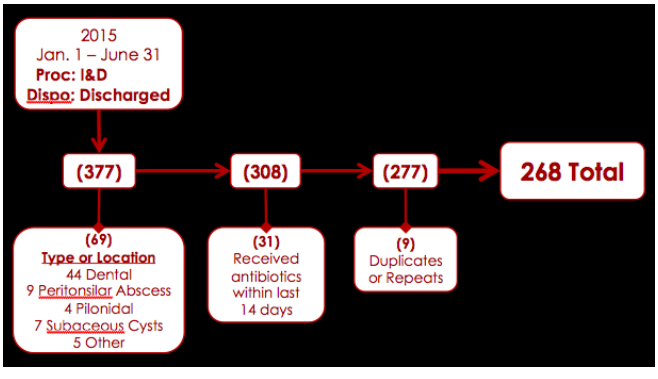

Figure 560 – Willman

561 Does Cell Phone Use Upon Arrival to the ED Predict Patient Acuity?

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Background: There are many factors that influence a physician's Gestalt when evaluating a patient in the emergency department (ED). Cognitive biases can negatively influence our perceptions. Cell phone use by a patient immediately upon arrival to the ED may be perceived by some clinicians as a less "sick" patient.

Objectives: To determine if using a cell phone during the initial phases of emergency department care is predictive of low patient acuity and ultimate disposition.

Methods: We performed a prospective, observational study using convenience sampling in an academic, adult ED and Level I trauma center (TC). Inclusion criteria: All patients arriving to the ED or TC via ambulance. Exclusion criteria: patients in law enforcement custody, obviously pregnant, or age <18. Patients presenting to the ED via ambulance were observed by trained research assistants who were blinded to study hypothesis and outcome measures. RA's recorded whether the patients used a cellular phone at any time from arrival until they were off loaded from the ambulance gurney. Patient demographics, disposition, and final diagnoses were obtained by retrospective chart review using a single, trained and monitored abstractor who was blinded to the cell phone use allocation. The primary outcome measure was the proportion of patients in each group who were discharged home. Fisher's exact test was utilized to compare proportions and calculate diagnostic test performance.

Results: During a 3-month period of time, 398 patients arriving by EMS were observed, with 394 having complete data comprised the final cohort. There were no differences between the two groups' baseline demographics. Primary outcome: We found no difference in the proportion who were discharged from the ED based on cell phone use No Cell use=162/353 (46%; 95%CI(41,51) % vs. Cell phone use=23/45 (51.10% 95%CI(37,65)%; P NS, Sensitivity=45.9 (95%CI 40.6,51.3) Specificity=48.9(95%CI 33.7,64.7) .

Conclusion: We found that cell phone use in the initial EMS arrival time is not predictive of patient acuity or disposition. Clinicians should be mindful of this potential factor which may lead to an attribution error.

562 Risks of Discharging Patients From Emergency Department with Abnormal Vital Signs

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Background: Abnormal vital signs are a common theme in cases of medical malpractice and unexpected death after discharge from the ED.

Objectives: Our primary objective was to evaluate the risks of discharging patients from the ED with abnormal vital signs. We hypothesized that patients discharged from the ED with abnormal vitals will have a higher rate of return within 72 hours.

Methods: We examined a retrospective cohort of all ED discharges from a level 1 trauma center from January 2010 to August 2014. Parameters for normal respiratory rate, heart rate, blood pressure, temperature, and oxygen saturation were gathered from the literature and stratified by age and gender. The primary outcome was rate of return within 72 hours. Secondary outcomes included percentage of patients with a full set of vital signs at discharge, percentage with at least one abnormal vital sign at discharge, and disposition of returning patients.

Results: There were 331,216 total visits with 15,563 return visits from 11,166 patients (9464 adults, 1702 children). For adults with abnormal vitals, the return rate was 5.71% versus 5.68% (RR 1.0, 95%CI 0.89-1.14). For pediatric patients, 6.09% with abnormal vitals returned, compared to 3.53% in the normal group (RR 1.7, 95%CI 1.53-1.95). Most (96.73% adult, 60.96% pediatric) patients were discharged with a full set of vital signs. Adults were far more likely than children to be discharged with at least one abnormal vital sign (97.69% vs. 8.97%). The most frequently abnormal vital sign was blood pressure (hypotension > hypertension) for adults and temperature (>100.5° F) for children.

Among patients who returned, 17.72% of adults and 13.75% of children were admitted.

Conclusion: Abnormal vital signs at discharge from the ED are associated with a greater likelihood of 72-hour return in the pediatric population. No difference was found in the adult population, despite a much higher rate of discharge with at least one abnormal vital sign. Future study to stratify which vitals are most associated with undesired outcomes and their degree of abnormality is underway.

563 ED Management of Patients with Febrile Neutropenia: Guideline Concordant or Overly Aggressive?

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Background: The Infectious Diseases Society of America and the American Society of Clinical Oncology recommend risk stratification of patients with febrile neutropenia (FN), according to the Multinational Association for Supportive Care in Cancer score, and discharge with oral antibiotics for low-risk patients lacking "other characteristics" such as inability to take oral medications.

Objectives: We studied guideline concordance of FN management in our ED.

Methods: Our urban, tertiary-care teaching hospital provides all emergency and inpatient services to a large comprehensive cancer center. We performed a structured chart review of all FN patients seen in our ED from 01/2010-12/2014. Using electronic medical records, we identified all visits by patients with an absolute neutrophil count <1000 cells/μL, and then included only patients without a clear source of infection. In this group, we assessed guideline concordance (disposition, antibiotic regimen), and 30-day outcomes (bacteremia or fungemia, sepsis, death).

Results: Of 173 qualifying visits, guidelines recommended outpatient management with oral antibiotics in 44 cases (25.43%, 95%CI 19.12-32.60). In this group, 90.91% of patients were admitted or treated with IV antibiotics, with 81.81% for both, resulting in a guideline concordance rate of 9.09% (95%CI 2.50-21.66). Among the guideline concordant admitted group, vancomycin was used without guideline support in 17.82% (95%CI 11.65-25.54). Comparing low risk with high risk patients, within 30 days, 4.54% vs. 8.52% had bacteremia or fungemia (difference = 3.98; 95%CI -3.84-11.79), 0% vs. 8.52% had sepsis (difference = 8.52; 95%CI 3.70-13.34), and 0% vs. 6.20% died (difference = 6.20; 95%CI 2.03-10.36).

Conclusion: Guideline concordance was low, with management tending to be more aggressive than recommended. A limitation of this research is that we do not know how the patients would have fared in the absence of such care. Nevertheless, we interpret these results as supportive of the guidelines. Unless data emerge that undermine the guidelines, we believe that many of these hospitalizations and very-broad antibiotic regimens can be avoided, decreasing the risks associated with hospitalization, while improving antibiotic stewardship and patient comfort.

564 Age-Adjusted D-Dimer Values in D-dimer Units (DDU) to Rule Out Pulmonary Embolism in the Elderly

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Background: Age adjusted D-dimer has been studied using assays that use fibrinogen equivalent units (FEU) but little literature exists with centers using assays with D-dimer units (DDU) such as the assay Hemosil DS. In a large number of studies exploring age adjusted D-dimer cut offs in FEU, the formula is age x 10 (if over 50). This formula is not useful if the assay is not measured in FEU. The conversion of FEU to DDU is taking the DDU value and multiplying it by 2. When using the manufacture cut of value of 230 DDU and multiplying this by 2, it does not come out to 500 FEU, therefore making the studied age adjusted values with the formula listed above difficult to use.

Objectives: This study compares utility manufacturer recommended cut-off point vs age-adjusted stratification. This study compares age adjusted D-dimer (in DDU) versus the standard value in patients over 50 who have PE.

Methods: Single center, retrospective case control study between the years of 2012-2015. All patients who had a D-dimer performed for the purpose of evaluating for PE were enrolled. Used manufacturer recommended cut off value for the Hemosil DS assay of 230 and used [(age-50) x 5] + 230 for age adjusted value

Results: Primary outcome was success in ruling out acute pulmonary embolism in the elderly population. There were 2288 patients enrolled, 120 diagnosed with PE. With the age-adjusted formula for DDU, the positive D-dimer had a sensitivity of 98% and specificity of 61%. When using the manufacturer cut of value for the Hemosil DS assay of 230 DDU, a positive d-dimer had a sensitivity of 100% and spec of 52%. CT would have been avoided in 196 patients using the age adjusted d-dimer. Of the 120 patients with PE, there were only 2 cases that the formula did not catch. Those 2 cases were diagnosed as "probable" PE per radiology as it was inconclusive on CT angiography of the pulmonary arteries if PE was acute on chronic in patients that had been previously diagnosed with PE in the past.

Conclusion: Compared to set d-dimer cut of value of 230 DDU, the age-adjusted formula was associated with a larger population of elderly patients in which the diagnosis of pulmonary embolus could be ruled out.

565 Attitudes Toward Clinical Trial Participation and Publication Among Research Subjects in the Emergency Department

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Background: Participants in clinical trials are motivated in part by a desire to contribute to medical knowledge. Many trials, however, are never published. It is unknown whether potential research subjects are aware of this problem, and whether the possibility of non-publication might influence decisions about trial participation.

Objectives: Our objective was to determine ED research participant knowledge about the non-publication of clinical trials, and to explore the impact that non-publication has on attitudes towards research participation.

Methods: This study was conducted in an urban, academic ED serving a socioeconomically diverse community. Eligible patients were English speaking, at least 18 years-old, and had a normal mental status. We established construct validity of the questionnaire through expert panel review, including members with expertise in publication bias, informed consent, and survey design. Trained research assistants approached eligible patients during randomly selected two hour blocks between 9 am and 10 pm, 7 days per week for a period of 13 weeks. Patients were asked about knowledge of clinical trial conduct and publication, and about factors that would influence their willingness to participate in a trial. Test-retest reliability was also assessed.

Results: Of 1691 patients approached, 799 (47%) answered the study questions. Among these 799 patients, 286 (36%) reported that they would generally like to participate in a trial, and 401 (50%) would

consider participation depending on study details. For most patients the publication of trial results was important (36%) or very important (48%). Patients underestimated typical delays between trial completion and publication (median estimate 12 months [IQR 6-18]). Estimated rates of non-publication varied widely (mean 51%, SD 27%). 63% would be less likely to participate in a trial if investigators had not published results from a prior study. 85% also wanted to receive information about the publication track record of sponsors and investigators during the informed consent process.

Conclusion: The majority of ED patients in this sample would consider trial participation. Patients value the public release of trial results, and believe that the informed consent process should address the possibility of non-publication.

566 Interruptions in the Emergency Department and Their Impact on Emergency Physicians

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Background: The ED is a dynamic environment characterized by unpredictable workloads with intermittent time critical activities, high uncertainty, and concurrent management of multiple patients. While interaction with other staff members is absolutely necessary for patient care; these interactions may interrupt the physicians from their current task and lead to unfavorable outcomes.

Objectives: To identify the impact of interruptions on emergency physicians' (EPs) work and to capture their perceived workload in a large tertiary care academic center.

Methods: This is a prospective study of direct observation. EPs were observed during their clinical shift (9 hours) over a four-month period. Healthcare systems engineering researchers collected data regarding the shift time, interruption type, duration, interruption location, impact to current task and priority level of the interruption. Additionally, at mid-shift and end-shift, EPs completed a modified NASA-TLX survey to capture their perceived workload. Data was analyzed using descriptive statistics and MANOVAs.

Results: The results revealed 2355 interruptions across the 28 shifts. EPs frequently encountered the following types of interruptions: Face-to-face (FTF) Nurse (22%), FTF Doctors (26%), Environment (21%), and FTF Other (17%) Most interruptions caused a break-in-task (53%), while only 1% of the interruptions caused a complete end to their current task. On average, EPs experience roughly 11.2 interruptions every hour, with each interruption lasting about 38 seconds (M=37.5, SD=74.84). MANOVAs indicated significant differences between shift times and interruption type (p=0.04) and there was a significant difference between shift times and priority level of interruptions (p=0.02). Additionally, the average NASA-TLX scores showed an increase in all six subscales, comparing mid-shift to end-shift.

Conclusion: These findings suggest that most interruptions that EPs encounter were face-to-face interactions, with the majority causing a break in their current task. EPs believed their workload increases from mid-shift to end-shift. Future analysis will examine if there is a correlation between interruptions and workload.

567 Effect of ED and ICU Capacity Strain on ICU Admission Decisions and Outcomes for Critically Ill Patients

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Background: Intensive Care Unit (ICU) admission decisions for critically ill ED patients are affected by inpatient bed availability. ICU admission delays have been shown to negatively affect patient outcomes, but ED volume and boarding times may also affect these decisions and associated patient outcomes.

Objectives: To investigate the effect of ED and ICU capacity strain on ICU admission decisions. To examine the effect of ED boarding on in-hospital mortality in times of high ED census.

Methods: We prospectively collected Medical ICU admission consults from the ED for 21 months at a large academic hospital. We electronically captured clinical data as well as ED and ICU census metrics from the medical record, and performed standardized chart review to obtain Mortality Probability Model III scores for severity of illness. Multivariate logistic regression was performed for ICU admission decisions and hospital mortality.

Results: 873 ED consults for ICU admission were logged, with 467 (52.6%) as "Accept" and 406 (45.8%) as "Deny" cases, with overall boarding times at median 5.2 (IQR 2.2-11.4) hours. Mortality was similar between groups (28.9 vs. 29.1%). Those accepted were younger (mean ± SD: 61 ± 16 vs. 65 ± 17 years, p<0.01) and more severely ill (median, IQR: 10.2%, 2.2-29.7 vs. 4.6%, 1.0-19.1) than those denied admission. A full ICU was associated with more Deny than Accept cases (52.1 vs. 47.9%, p=0.02). In the multivariate model, including adjustment for severity of illness and ICU admission decisions, increased ED volume of high acuity patients was associated with higher odds of mortality (OR 1.20, 95%CI 1.02-1.41), but ED length of stay did not predict this outcome (OR 0.99, 0.97-1.01). In subgroup analysis of ICU Accept cases, nighttime consults and longer boarding times were associated with higher mortality (OR 1.86, 1.08-3.21; and OR 1.22, 1.01-1.47, respectively).

Conclusion: The decision to admit critically ill ED patients is affected by ICU bed availability, though inpatient capacity strain did not affect later outcomes of mortality after adjusting for severity of illness. Concurrent high ED volume of other acute patients was associated with worse outcomes for all consults, though prolonged wait times had a negative impact on only ICU boarders.

568 The Impact of an ED-Based Critical Care Unit on the Provision of Palliative Care in the Emergency Department

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Background: ED use is common in the last six months of life and can be burdensome for patients and caregivers, but may represent an opportunity to initiate palliative care interventions. Despite known benefits of early palliative care, emergency providers are uncertain how to best initiate and deliver these interventions in the ED. In February 2015, our institution opened the Emergency Critical Care Center (EC3), an ED-based ICU staffed by subspecialty trained emergency medicine/critical care faculty. The EC3 offers an opportunity to provide advanced resuscitative care, as well as time and resources for palliative interventions.

Objectives: To retrospectively review the proportion of ED patients who received a palliative intervention before and after the opening of the EC3.

Methods: All patients presenting to the ED from February through September of 2014 and 2015 were reviewed. A palliative intervention was defined as (1) change to DNR status, (2) Palliative Medicine consult order or (3) discharge to hospice.

Results: Palliative interventions originating in the ED and EC3 are illustrated in table 1. Since the opening of the EC3, the proportion of patients receiving a palliative care intervention during the emergency phase of care has increased. The proportion of patients receiving an intervention within the first 24 hours of admission has concurrently decreased. Most of these changes have taken place in the EC3.

Conclusion: Patients receiving a portion of their care in EC3 had more palliative interventions prior to admission and fewer palliative

Table 1. Palliative Interventions in the Emergency Department

	2014	2015
Change to DNR status in ED	8	6
Change to DNR status in EC3	-	69
Palliative Medicine consults for all encounters	279	531
Palliative Medicine consult in ED	0	1
Palliative Medicine consult in EC3	-	19
Discharge to hospice for all encounters	290	262
Discharge to hospice from ED	3	0
Discharge to hospice from EC3	-	5

Table 568: Harvey.

interventions in the first 24 hours after admission. This is likely due to additional time for goals of care discussion and the ability to obtain Palliative Medicine and Social Work consults 24 hours a day. A pathway for initiating palliative interventions during an extended ED phase of care may benefit both critically ill patients and also those whose acute needs included organized palliative care. Having identified relevant patient populations, next steps include development of an evidence-based protocol to aid providers in the management of patients with acute palliative needs, determination of disease states which should this protocol, and resource utilization metrics.

569 A Critical Analysis of Unplanned Transfer to the ICU Within 48 Hours of Admission from the ED

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Background: Unplanned intensive care unit (ICU) transfer (UIT) within 48 hours of ED admission increases morbidity and mortality. We hypothesized that many UITs do not have critical interventions (CrI) and that CrI is associated with worse outcomes.

Objectives: Our objective was to characterize all UITs (including dying prior to ICU), the proportion with CrI, and the effect of having a CrI on length of stay (LOS) and mortality.

Methods: Single center, retrospective cohort study of UITs within 48 hours from 6/1/2008 - 5/31/2013 at an urban, academic medical center. We queried the hospital clinical data warehouse and included those ≥ 18 years and without advanced directives (AD). We used a modified Delphi technique for developing a CrI list. Trained MD chart abstractors extracted data and met periodically to reach consensus. Data included demographics, comorbidities, reason for UIT, total LOS, CrI, and mortality. We calculated descriptive statistics with 95% confidence intervals. Blinded reviewers extracted a 10% random sample of charts and chance-corrected agreement (Cohen's Simple Kappa) was measured for key variables.

Results: 837/179,787 (0.47%) non-ICU admissions from the ED had a UIT within 48 hours and 86 admitted patients died prior to ICU. We excluded: 23 AD, 117 post-operative transfers, 177 planned ICU transfers, and 4 with missing data. Of the 516 remaining, 65% (95% CI 61% - 69%) had a CrI. UIT reasons: 33 medical errors, 90 had disease processes not present on arrival, and 393 had clinical deterioration. Mortality was 10.5% (95% CI 8%-14%) and mean LOS was 258 hours (95% CI 233-283) for those with a CrI, while the mortality was 2.8% (95% CI 1%-6%) and mean LOS was 177 hours (95% CI 157-197) for those without a CrI. Therefore, mean LOS for those receiving CrI was, on average, 80.7 hours longer than for those receiving no CrI, with a margin of error of 32.0 hours. Cohen's Simple Kappa ranged from 0.81 and 0.84 for the exclusion and admission criteria variables, respectively, and 0.67 for the transfer category variable.

Conclusion: We found UIT was rare over the study period, and those who received a CrI (65%) had increased morbidity and mortality. These results provide insight into our understanding of UITs within 48 hours to an ICU following ED admission as a measure of quality care and screening tool to detect adverse events

570 Idarucizumab for Reversal of the Anticoagulant Effects of Dabigatran in Patients in the Emergency Setting of Major Bleeding, Urgent Surgery, or Interventions

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Background: Idarucizumab, a humanized Fab fragment directed against the oral anticoagulant dabigatran, was approved for use in the USA in October2015.

Objectives: RE-VERSE AD™ is an ongoing, multinational, single, cohort study investigating the safety and efficacy of 5 g idarucizumab to reverse dabigatran in patients with life-threatening or uncontrolled bleeding (Group A), or who require emergency procedures (Group B).

Methods: The primary endpoint is the maximum reversal of the anticoagulant effect of dabigatran, based on dTT or ECT Clinical outcomes are also assessed.

Results: Data from 123 patients (Group A: 66, Group B: 57) are included in this analysis. Of these, 95% were receiving dabigatran for atrial fibrillation, median age was 77 years, 52.8% were male, median CrCl was 55.1 mL/min, and 4% had a history of prior major bleeding. Of the 66 bleeds (27 GI, 24 intracranial and 21 other bleeds; some patients had > 1 source of bleed), 63 were classified as major or life-threatening and 27 patients were hemodynamically unstable. After infusion of 5 gram idarucizumab, complete dabigatran reversal occurred in >89% of patients. In 48 assessable patients in Group A, median time to bleeding cessation was 9.8 hours. Median time to

surgery in Group B was 1.7 hours; normal intraoperative hemostasis was reported in 48/52 assessable patients and no major bleeds occurred post-operatively. Thrombotic events occurred in five patients between 2 and 24 days post infusion. None were anticoagulated at the time of the event. There were 26 deaths (21%) due to worsening of the emergency situation or to comorbidities. Updated results will be presented.

Conclusion: Idarucizumab rapidly reverses dabigatran in emergency situations

571 PReDICT: Prognosticate Resuscitation Demands Integrating Computerized Triage

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Background: A paramount skill in Emergency Medicine is identifying patients in the department who require early and aggressive resuscitation, while also accounting for absolute and relative acuity. Conventionally, this requires interrogating individual charts within the electronic medical record (EMR) for key data points relevant to making such a determination.

Objectives: Our goals were twofold. First, creation of a dedicated page within the existing EMR which displays all patients in the department alongside their current vital signs, laboratories, and other values of interest (eg. fluid balance). Second, an automatically-updating means to quantify and thus sort patients by their degree of physiological derangement and organ dysfunction within that display.

Methods: An intuitive point system loosely based off the Modified Early Warning System was devised. Points are summated to give the total PReDICT score. To account for new data points and new patients, and recognizing that vitals and labs are dynamic variables which reflect progression or resolution of acute disease, a new score is automatically recalculated every 15 minutes.

Results: The PReDICT tool, which includes both a novel dynamic acuity scoring system and practical display is fully operational within our existing EMR. Current and max PReDICT scores are viewable on this display, as are the current vital signs and labs used in their calculation (*Fig 1*). Trend in PReDICT score and individual parameters are also viewable by selecting a specific patient (*Fig 2*).

Conclusion: PReDICT facilitates real-time rapid and efficient identification of patients with the highest degree of physiological derangement and organ dysfunction within the ED. Machine learning and statistical analysis Machine learning and statistical analysis are underway to weight composite variables and translate early dynamic changes into predictive power. PReDICT will expedite and improve resuscitation, resource allocation, and safe hospital disposition.

572 Ultrasound-Guided Internal Jugular Vein Catheterization: Where Are We Now?

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Background: Central venous catheter placement is a common procedure performed on critically ill patients. In an era of simulated training of U/S-guided catheter placement, the risks of complications have presumably fallen. Whether level of training is associated with decreased success or higher complication rates is unclear.

Objectives: We hypothesized that a lower level of training would be associated with less successful placement and increased complication rates.

Methods: This was a retrospective cohort study inclusive of all U/S-guided right internal jugular vein (RIJV) catheterization attempts over a one-year period. Procedures were performed in adult ICUs and EDs at a large academic tertiary care hospital system. All relevant trainees had standardized simulation training in U/S-guided RIJV catheter placement. Standardized procedure notes and post-procedure CXRs

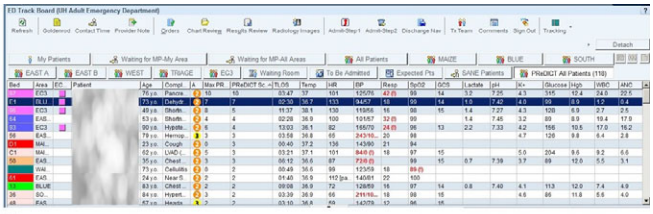

Figure 1. PReDICT displays all patients in the department and their up-to-date vitals and labs, sorted by the summation of their physiological derangements and organ dysfunction. Patients in the Emergency Critical Care Center (EC3), designated by the pink box in column #3, consistently demonstrate high PReDICT scores.

Figure 571 – Glazer

Figure 2. Patient chart showing initial improvement with subsequent deterioration.

Figure 571 – Glazer

were reviewed to verify success rates and complications such as pneumothorax and misplacement. Data also included key patient characteristics that could potentially affect placement (age, sex, mechanical ventilation, emphysema, dialysis and obesity). Analysis consisted of multivariate regression analysis to investigate if level of training adjusted for these key patient characteristics was associated with decreased placement or higher complication rates.

Results: There were 1322 U/S-guided RIJV catheterization attempts investigated with an overall success rate of 96.9%. Residents performed 75% of attempts, and 12% and 36% were performed by first and second year residents, respectively. There was only one pneumothorax (0.1%, 95% CI 0-0.4%), and the rate of catheter misplacement was 1% (95% CI 0.6-1.7%). There were no arterial placements. There was no statistically significant difference in odds of successful placement with respect to level of training (p=0.70) in univariate analysis or when adjusted for patient characteristics. Only female sex of the patient was associated with lower overall odds of successful placement (OR 0.47, 95% CI 0.24-0.93, p=0.03). Neither level of training nor patient characteristics had an impact on the rate of complications.

Conclusion: In a teaching hospital system, U/S-guided RIJV catheter placement had a high success rate and low complication rates, irrespective of the operator's level of training.

573 Analysis of Intraosseous Blood Samples Using an EPOC® Point-of-Care Analyzer During Resuscitation

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Background: In the early phases of resuscitating critically ill patients, especially those in cardiac arrest, IV access can be difficult to obtain. Intraosseous (IO) access is often used in these critical situations to allow medication administration. When no IV access is available, it is difficult to obtain blood for point of care analysis, yet this information can be crucial in directing the resuscitation. We hypothesized that IO samples may be used with point of care devices to obtain useful information when seconds really do matter.

Objectives: To compare blood gas and electrolyte results from IO and IV samples using a point of care device in critically ill patients

Methods: Patients presenting to the emergency department requiring acute resuscitation and IO line placement were prospectively enrolled. IO and IV samples obtained within 5 minutes of each other were run on EPOC® point of care analyzers. Sample types were compared using Bland Altman Plots and intraclass correlation coefficients.

Results:

In this initial analysis of 10 convenience sampled patients,: the EPOC® point of care analyzer produced reliable results from IO samples. IO and IV samples were most comparable for base excess, lactate, pH and sodium. All values were within +/- 1.96 SD on Bland Altman plots for base deficit; single outliers for pH, sodium and lactate were observed, the remainder of values for these variables showed good agreement. Intraclass correlation coefficients were excellent (> 0.8) for pH, sodium, lactate and base excess. Correlations for other variables measured by the EPOC® analyzer (potassium, calcium, glucose) were not as robust in this initial analysis.

Conclusion: IO samples can be used with a bedside point of care analyzer to rapidly obtain some useful information during resuscitations when IV access is difficult. To our knowledge this is the first study to test this hypothesis in critically ill patients.

574 Engineering a Translational PECAM-1 Targeted Nanoparticle for Emergent Endothelial Delivery of Therapeutics to the Vascular Endothelium

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Background: Endothelial cells (EC) represent an important target for pharmacologic intervention in emergency medicine, given their central role in acute thrombotic, ischemic, and inflammatory conditions. Targeted nano carriers, bearing antibodies to endothelial surface molecules like the Platelet Endothelial Cell Adhesion Molecule-1 (PECAM-1/CD31), accumulate in the pulmonary vasculature, allowing effective delivery of a wide variety of small molecule and biotherapeutic agents. To translate such "vascular immunotargeting" to clinical practice, it is necessary to replace antibodies with advanced ligands that are more amenable to use in humans.

Objectives: We sought to engineer a single chain variable antibody fragment (scFv) that binds with high affinity to human PECAM-1 and cross-reacts with its counterpart in rats and other animal species, allowing parallel testing *in vivo* and in human endothelial cells in a microfluidic model.

Methods: The anti-PECAM scFv was cloned from its parental hybridoma using a novel signal peptide primer set, which allows selective amplification of antigen specific sequence, as opposed to myeloma derived variable heavy and light chain sequences. Site-specific modification of the scFv allowed conjugation to fluorescent superoxide dismutase (SOD)-containing liposomes, which were tested in rats and in a human whole-blood perfused endothelial-lined microfluidic chamber.

Results: The anti-PECAM scFv showed high affinity and specificity for human PECAM-1. Following site-specific conjugation to fluorescent SOD liposomes, specific pulmonary uptake was seen by radio-tracing of the enzyme cargo following intravenous injection in rats. Fluorescence imaging of lung slices confirmed distribution to lung endothelium. Likewise, specific binding was seen to human endothelial cells exposed to flowing human whole blood.

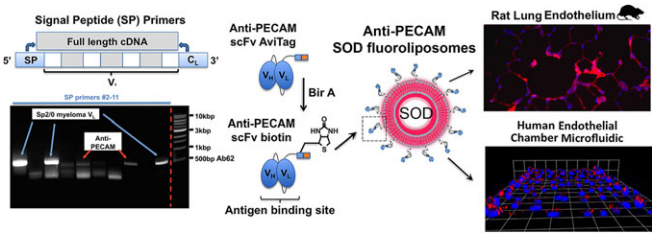

Figure 574 – Greineder

Conclusion: This study provides a template for molecular engineering of ligands, enabling studies of drug targeting in animal species and subsequent use in humans.

575 Perspectives on the Early Diagnosis and Management of Severe Sepsis and Septic Shock in the Emergency Department

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Background: Overwhelming evidence supports the early recognition and aggressive treatment of severe sepsis and septic shock, and ED sepsis care is a new CMS quality measure.

Objectives: Our objective was to assess staff knowledge and identify potential barriers to optimal sepsis care and potential quality measure compliance.

Methods: We surveyed full-time, active clinical staff (RNs, residents, and attending physicians) in the ED with an anonymous online survey with 12 questions assessing: 1) baseline knowledge and behaviors in the identification and treatment of severe sepsis and septic shock and 2) barriers and delays to meeting Surviving Sepsis Campaign (SSC) bundle recommendations. Each question utilized a 5-point Likert scale, except one item which required ranking 7 factors which may delay sepsis treatment. Average response values were compared between the two groups using independent sample t-tests.

Results: Survey response rates included 84% of RNs (73/87) and 75% of MDs (42/56). Both groups were confident in their ability to recognize early sepsis (RN=4.32, MD=4.50; p=.10), though RNs reported significantly less familiarity with SSC recommendations (RN=3.71, MD=4.31; p <.001) and lower compliance with SSC recommendations (RN=3.63, MD=3.98; p<.005). There was agreement that delays in sepsis recognition (p=.711) and treatment (p=.523) exist in our ED. Although there was general agreement about sources of delay in the treatment of severe sepsis and septic shock, the specific ordering varied as follows (RN rank, MD rank): Lack of recognition in triage (#2, #1; p=.06), delay in diagnosis of sepsis by physicians (#1, #4; p < .001), nursing delays (#4, #2; p=.10), and lab delays (#3, #3; p=.31). Both groups agreed that triage screening for sepsis would be beneficial (3.51, 3.76; p=.182).

Conclusion: RNs and MDs endorse comfort with recognition of early sepsis. Among delays to sepsis care in our ED, RNs assign more of sepsis care delays to MD diagnosis than MDs self-assign. Both groups identified the lack of sepsis recognition in triage as a factor in care delays and supported a formal triage sepsis screening process. These results demonstrate potential support for implementation of sepsis screening to facilitate the early diagnosis of sepsis.

576 Compel Study: Comparison of Antibiograms for Urinary Tract Infections Between Hospital-Wide, Inpatients and Emergency Department-Specific Sampling

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Background: ED physicians' empiric antibiotic choice for urinary tract infections (UTIs) at discharge or hospital admission is based on hospital-wide antibiograms, which report antibiotic susceptibility patterns. Comingling of inpatient and ED patients in the same hospital-wide antibiogram potentially skews susceptibility patterns.

Objectives: We tested the hypothesis that there would be no significant differences in antibiotic susceptibility of urinary *Escherichia coli* (*E. coli*) isolates sampled from ED and inpatients (hospital-wide) compared to inpatients (alone) and discharged ED patients (alone).

Table #1 Comparison of Antibioitic Susceptability between Hospital-wide versus ED and Inpatient Antibiograms

Antibiotic	Amox/Clav	Amp	Cipro	Levo	Nitro	Tetra	TMP/SMX
ED only	89.8%	62.5%	86.7%	86.3%	98%	73%	71%
	(82%-90%)	(59%-68%)	(83%-91%)	(82%-91%)	(97%-100%)	(68%-78%)	(65%-77%)
p-value	0.02*	0.04*	0.04*	0.049*	0.78	0.56	0.42
Hospital-wide	83.5%	54.5%	80.7%	80.4%	99%	71%	68.2%
	(80%-87%)	(50%-59%)	(79%-84%)	(77%-84%)	(98% -100%)	(67%-75%)	(64%-72%)
p-value	0.05	0.0001*	0.0001*	0.0001*	0.55	0.25	0.11
In-patients	79.2%	42.3%	71.4%	71.4%	99.4%	67.8%	63.7%
	(73%-85%)	(35%-50%)	(64%-78%)	(65%-78%)	(98%-100)	(61-75%)	(56%-71%)

Figure 576 – Pulia

Methods: A cross-sectional study in a tertiary care center with 75,000 annual ED visits. Published hospital-wide antibiogram often are organized by individual bacteria irrespective of culture site or sampling location (ED vs. inpatient). To produce a hospital-wide antibiogram representative of only *E. coli* UTIs, we obtained electronic medical records of all *E. coli* isolates exclusively from urine specimens and recorded antibiotic susceptibility patterns from a random sample of ED and inpatients. Data will be presented as medians with IQR (25%, 75%), or frequencies (%) with 95% confidence intervals (95%, CI). Group comparisons by Fisher's Exact test, alpha=0.05, 2-tails. Estimated sample size required 143 isolates per group to detect a 10% difference in antibiotic susceptibility alpha=0.05, power= 80%

Results: We reviewed 424 *E. coli* urine isolates (256 ED and 168 inpatients) from patients with a median age 52 years (30.1, 72.3), 77% Female. Table 1 shows statistically significant differences in *E. coli* susceptibility for multiple antibiotics between hospital-wide and both ED and inpatient samples, though only hospital-wide vs inpatient were sufficiently different to change empiric antibiotic choices.

Conclusion: We found statistically significant differences in *E. coli* antibiotic susceptibility between hospital-wide and both ED and inpatient groups, but differences were considered only clinically significant to alter prescribing patterns for inpatient admissions.

577 Vancomycin Use in the Emergency Department Remains a Target for Improved Antibiotic Stewardship

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Background: Antibiotic resistant bacteria are a growing public health concern and inappropriate antibiotic use in healthcare settings is a primary, modifiable driver of this trend. Optimizing the use of vancomycin is critically important to preserve the utility of this first-line treatment for methicillin-resistant *Staphylococcus aureus* (MRSA). Studies examining inappropriate ED vancomycin use report rates as high as 30%.

Objectives: To determine the appropriateness of prescribing and dosing of vancomycin in a tertiary care ED using clinical variables and current best practice guidelines.

Methods: This retrospective cohort study was conducted on 150 consecutive patients who were prescribed vancomycin. Data collected included demographics, vitals, labs, MRSA risk factors, vancomycin dosing, past medical history, and ED diagnosis. Interrater reliability was assessed using a blinded second review of 30 random charts (Cohen's κ). The primary outcome variable, appropriateness of vancomycin use, was defined prior to data collection and based on national guidelines. Appropriate dosing was also evaluated based on national guidelines (15-20 mg/kg of actual body weight)

Results: Only 2% of vancomycin use was classified as inappropriate. Interrater reliability was in the excellent range (κ=.90, 95%CI 0.79 to 1.0). MRSA was cultured in 5% of patients who appropriately received vancomycin, and in 0% of those who did not meet any of the criteria for receiving the drug. A correct dose of vancomycin was ordered in 52.3% of patients.

Conclusion: Vancomycin was used for an appropriate indication in the vast majority of cases. Vancomycin dosing outside of the recommended range remains common. Future antibiotic stewardship efforts targeting ED vancomycin use should focus on dose optimization.

578 Using Antimicrobial Films on Stethoscopes to Reduce Bacterial Colony Counts

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Background: Health care providers are notorious for forgetting to clean their stethoscopes and wash their hands after every patient encounter. A new class of chemicals called cationic phenylene ethynylene (CPE) compounds were found to have significant antimicrobial activity when exposed to visible light in the laboratory setting. These compounds are easily embedded into films or sprays that can coat medical surfaces like stethoscopes without hindering their function.

Objectives: Our aim is to see if CPEs embedded in a thin plastic film that sticks onto and covers the diaphragm of a stethoscope would be effective at reducing bacterial colony counts during daily use in the emergency department.

Methods: This was a pilot, proof of concept, pragmatic randomized controlled trial (RCT). Three groups of 5 stethoscopes each were randomized to either receive an active film, placebo film or no film at all. The stethoscopes were given to various providers to use as they normal would. They were then cultured at random intervals during a 3-week period at least 3 different times each under normal usage conditions.

Results: The stethoscopes with CPE films showed no bacterial growth on 5 of 17 cultures. The non-active films showed no growth on 0 of 18 cultures. The stethoscopes without films showed no bacterial growth on 1 of 14 cultures and growth around the rim only on 3 stethoscopes

Conclusion: This was a proof of concept RCT to see if such a study would be feasible and if there was a utility to using these films in the clinical setting. The study shows potential for possible clinical benefit that needs to be further elucidated using a larger sample size. The finding of bacteria on the rim of the no film stethoscopes was interesting as stethoscopes with exposed rims in the CPE group also showed some bacterial growth. This should be explored further in the future as well.

579 A Descriptive Study of the Results of Blood Cultures in Discharged Emergency Medicine Patients

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Background: The clinical utility of blood cultures in the diagnosis of infection for patients who are admitted has been studied. However, limited information is available on the utility of obtaining blood cultures in patients who are discharged from the ED.

Objectives: To determine prevalence of bacteremia and describe characteristics of patients with positive and negative blood cultures obtained during an ED visit and discharged.

Methods: This is a retrospective cohort study of all discharged adult patients seen in an urban ED in 2014 with blood cultures obtained during their visit. The primary aim was to examine the incidence of positive cultures and the microorganism species. The secondary aims were to compare patient demographics, comorbidities, triage vital signs, lactate and WBC levels and administration of antibiotics in the ED.

Results: Total number of blood cultures obtained on all discharged ED patients in 2014 was 1105. Following exclusion of patients not

meeting study criteria, 913 (96.5%) patients had a negative blood culture result and 33 (3.5%) had positive cultures. The mean age was 50 ± 18 years and 52 ± 17 years for patients with negative and positive cultures, respectively. In patients with positive cultures, statistically significant differences were found in mean lactate (2.53 v 1.48, p = 0.03), shock index (0.68 v 0.41, p < 0.0001) and respiratory rate (20.52 v 18.54, p= 0.046). Patients with positive blood cultures on the initial visit were contacted and 21 (63.6%) patients returned for repeat testing. Four (19.0%) patients had a repeat positive culture.

Conclusion: The incidence of positive blood cultures in discharged ED patients was significant. Clinical indicators associated with positive cultures include an elevated lactate, shock index, and respiratory rate. Follow-up failures of patients with positive cultures are frequent and have quality implications.

580 Atypical Organisms Cause a Clinically Significant Number of Septic Arthritis Cases in the Emergency Department (ED)

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Background: The diagnosis and management of septic arthritis in the ED is challenging. The prevalence of atypical pathogens is variable, limiting empirical selection of antimicrobial agents. In the presence of evolving risk factors, such as intravenous drug use (IVDU), current management strategies may be ineffective.

Objectives: To describe the microbiology and initial treatment of septic arthritis in the ED. We also tested the hypothesis that IVDU would be associated with atypical pathogens.

Table 1. Differences in patients with typical and atypical organisms

	Typical Organism (n=41)		Atypical Organism (n=24)		Diff.	95% CI Lower	95% CI Upper	P Value
Age – mean (SD)	51	(17)	49	(16)	2	-6.5	10.5	0.645
White – n (%)	20	(48.8)	14	(58.3)	9.6%	-15.4%	34.5%	0.608
Male – n (%)	24	(58.5)	14	(58.3)	-0.2%	-25.0%	24.6%	0.987
Medical History – n (%)								
Excessive Alcohol Use	4	(9.8)	4	(16.7)	6.9%	-10.5%	24.4%	0.454
Diabetes	11	(26.8)	5	(20.8)	-6.0%	-27.2%	15.2%	0.588
HIV/AIDS	3	(7.3)	0	(.0)	-7.3%	-15.3%	0.7%	0.175
IV Drug Use	8	(19.5)	8	(33.3)	13.8%	-8.6%	36.2%	0.212
Inflammatory Joint Disease	12	(29.3)	12	(50.0)	20.7%	-3.6%	45.1%	0.115
Dialysis/ESRD	2	(4.9)	3	(12.5)	7.6%	-7.2%	22.4%	0.266
Immunosuppressants	2	(4.9)	4	(16.7)	11.8%	-4.5%	28.1%	0.465
Cancer	10	(24.4)	2	(8.3)	-16.1%	-33.2%	1.1%	0.699
Joint Surgery/Prosthesis	19	(46.3)	13	(54.2)	7.8%	-17.3%	32.9%	0.612
Joint Involvement* – n (%)								
Shoulder	5	(12.2)	0	(0.0)	-12.2%	-22.2%	-2.2%	0.149
Sternoclavicular	1	(2.4)	0	(0.0)	-2.4%	-7.2%	2.3%	1.000
Hand	4	(9.8)	1	(4.2)	-5.6%	-17.7%	6.5%	0.644
Wrist	6	(14.6)	3	(12.5)	-2.1%	-19.2%	15.0%	1.000
Elbow	3	(7.3)	1	(4.2)	-3.2%	-14.4%	8.1%	1.000
Hip	4	(9.8)	7	(29.2)	19.4%	-0.9%	39.7%	0.083
Knee	19	(46.3)	11	(45.8)	-0.5%	-25.6%	24.6%	0.968
Foot	1	(2.4)	0	(0.0)	-2.4%	-7.2%	2.3%	1.000
Ankle	4	(9.8)	1	(4.2)	-5.6%	-17.7%	6.5%	0.644
Discharged from ED – n (%)	2	(4.9)	2	(8.3)	3.5%	-9.4%	16.3%	0.622

*More than one option is possible

Table 580: Loftus.

Methods: This retrospective review included patients with suspected septic arthritis who presented to an urban, academic ED between October 2012 and January 2015. Patients were identified using ICD-9 codes and CPT codes. Cases were defined by synovial Gram stain or culture, operative treatment, purulent fluid, or continued clinical suspicion. Demographics, risk factors, and clinical management were abstracted. Atypical organisms were defined as methicillin resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, vancomycin resistant *Enterococci* (VRE), or *Neisseria gonorrhea*. Antibiotic appropriateness was determined by microbiologic susceptibility testing. Independent t-tests, Chi-square test or Fishers Exact test were used to test for differences between groups. Effect sizes and 95% confidence intervals were calculated.

Results: Of 252 suspected cases identified, 91 (36%, 95% CI 30% - 42%) were true septic arthritis cases and 32/91 (35%) were culture negative. Organisms were identified in 65/91 and 24/65 (37%, 95% CI 24% - 55%) were atypical. The most common atypical organism was MRSA, which occurred in 17/65 (26%). *Staphylococci* (45/65, 69%) and *Streptococci* (15/65, 23%) caused the majority of infections. Two patients had *Neisseria gonorrhea*, 1 had VRE, and 2 had *Pseudomonas aeruginosa*. Initial antibiotic coverage was insufficient in 8 cases. The prevalence of IVDU was not different between those with typical and atypical infections (Table 1).

Conclusion: Atypical organisms occurred in over one-third of septic arthritis cases in our ED. Providers should consider using broad spectrum antibiotics that include coverage for atypical organisms. Common risk factors, such as IVDU, were not associated with atypical organisms and may not help in antimicrobial selection.

581 Forecasting Emergency Department Visits During a Disease Outbreak Using Internet Data

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Background: A recent study showed internet searches on a Swedish national healthcare website were significantly correlated with next day ED visits suggesting internet search data may be useful in forecasting ED visits. In August of 2014, Enterovirus D68 initially affected children in the US Midwest and subsequently spread throughout the country causing severe respiratory (RESP) disease. The first confirmed case of Enterovirus D68 was reported in the New York Metropolitan (NY Metro) area on September 17, 2014.

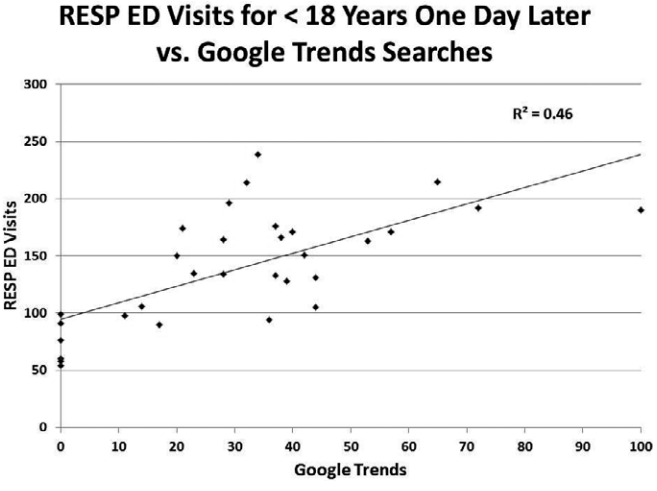

Figure 581 – Allegra

Objectives: To determine if internet searches of "Enterovirus" were correlated with next day ED visits for RESP disease in children during the Enterovirus outbreak in the NY Metro area.

Methods: Design: Retrospective cohort of consecutive ED visits for patients < 18. Setting: 23 hospitals with 22,000 to 86,000 annual visits within 100 miles of New York City from 9/1/2014 to 10/1/2014. Protocol: We identified RESP visits using a RESP syndrome filter for patients' chief complaints developed for the NY State Department of Health. We also conducted a Google Trends search with the term "Enterovirus" in the NY METRO area for the same time period. Google Trends provide normalized volumes for a search term by geographic area over a specified time. Data are displayed on a 0 to 100 scale, with 100 being the highest volume in a given search. We plotted the daily next day RESP visits versus the daily Google Trends and performed a linear regression analysis.

Results: The database contained 217,394 total ED visits with 45,582 visits (21%) < 18 years old. Of the 45,582 visits, 4294 were RESP visits (9%). There was a 2.2 fold increase in ED RESP visits for patients < 18 for the ten days starting on 9/17 compared to the first 10 days of September. The correlation between daily next day ED RESP visits and daily Google Trends was statistically significant (R^2= 0.46, p= 0.01) (Figure 1).

Conclusion: We found that next day ED RESP visits were correlated with internet searches during the Enterovirus outbreak in the NY Metro area similar to the Swedish study. For disease outbreaks in the U.S. analyzing internet searches may be useful in forecasting next day ED visits.

582 Feasibility of Novel Influenza Interventions in Emergency Department Settings

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Background: The ED often serves as the front line for combating emerging infectious diseases of global significance. Critical interventions for life threatening diseases may be best implemented early during the course of patient care. However, the ED is traditionally perceived as a poor environment for clinical trials investigating novel therapies.

Objectives: Our objective was to determine the feasibility and safety of screening and enrolling critically ill ED patients with severe influenza onto a study administering an investigational plasma transfusion.

Methods: Our ED participated in a randomized, open-label, phase 2 trial investigating the efficacy and safety of plasma-derived immunotherapy for treating severe influenza. Adult and pediatric patients were enrolled if they were being hospitalized for severe influenza and showed an abnormal respiratory status, defined by hypoxia or tachypnea. Patients were randomized to receive two units of anti-influenza plasma (or the pediatric equivalent) with standard care, or standard care alone. We utilized an interdisciplinary team approach involving the ED, information technology, blood bank, infectious diseases, and intensivists to develop a system for screening and plasma delivery. The use of point- of- care assays and electronic medical records facilitated the rapid identification of eligible patients.

Results: Between February 2014 and May 2015, of the 2614 patients with influenza like symptoms, we screened a total of 682 potential subjects; 95% did not meet criteria, and of the 34 eligible, 44% refused. A total of 19 patients were enrolled and 10 randomized into the study from our facility, including 9 adults and one child. All patients but one were enrolled in the ED. Six patients received plasma. There was one death in a subject who did not receive plasma. This site, which based its enrollment on ED presentation, had the second highest enrollment in the trial.

Conclusion: Randomized trials of novel therapies are feasible in acutely ill ED patients. Careful coordination of care, which includes use of information technology and streamlining management with inpatient services, is critical to successful implementation. ED participation should be considered in clinical trials designed to investigate novel interventions in global pandemic situations.

583 Accuracy of Sonographic CHF Diagnosis Compared to Conventional CXR in Patients Presenting with Undifferentiated Shortness of Breath

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Background: The number of sonographic B-lines detected with lung ultrasound (LUS) performed by expert sonographers correlates with the degree of pulmonary edema found CXR of patients with congestive heart failure (CHF). There is insufficient data to demonstrate that LUS performed by novice sonographers (N) is as reliable as experts (E) when diagnosing CHF.

Objectives: We set out to determine if novice-performed LUS is as reliable as expert-performed LUS to diagnose CHF in patients with undifferentiated shortness of breath (uSOB).

Methods: We enrolled a prospective convenience sample of 95 patients presenting to the ED with uSOB. Two blinded emergency physician sonographers performed consecutive LUS within 2 hours of patients' arrival, and assessed for sonographic B-lines. A study coordinator performed enrollment and data collection. Sonographer pairs were E/E or E/N. Novices had performed 5 prior LUS after standardized training, experts had >150 LUS exam experience. LUS findings were compared to CXR, which was obtained within 2 hours of LUS, and within 3 hours of a patient's arrival. CXRs were interpreted by a board-certified study radiologist and evaluated for interstitial edema using a CHF score previously validated. Agreement between CXR and LUS of CHF was assessed using a prevalence-adjusted bias-adjusted Kappa statistic (PABAK).

Results: Overall agreement between LUS and CXR diagnosis of CHF was substantial (82.9%; Kappa 0.66). We found similar agreement between E and N sonographers, with experts outperforming novices (Figure).

Conclusion: In this study, novice sonographers showed moderate agreement with CXR, while experts showed substantial agreement with CXR in diagnosing CHF. Overall, agreement of LUS with CXR in assessing pulmonary edema, or CHF, was substantial.

Table 1: Agreement in Diagnosis of CHF between Lung Ultrasound and CXR Raters.

	Overall (Total = 175)		Novices (Total = 68)		Experts (Total = 107)	
	N	%	N	%	N	%
Ultrasound [-], X-Ray [-]	134	76.6	49	72.1	85	79.4
Ultrasound [+], X-Ray [-]	27	15.4	13	19.1	14	13.1
Ultrasound [-], X-Ray [+]	3	1.7	1	1.5	2	1.9
Ultrasound [+], X-Ray [+]	11	6.3	5	7.4	6	5.6
Observed Percentage of Agreement	82.9%		79.4%		85.1%	
Expected Percentage of Agreement	73.8%		69.4%		76.6%	
Kappa Statistic* (Level of Agreement)†	0.66 (Substantial)		0.59 (Moderate)		0.70 (Substantial)	

Based on diagnoses provided by ultrasound and X-ray. Presence of CHF defined as diagnosis of unspecified CHF, mild CHF, moderate CHF, or severe CHF.
*Prevalence-adjusted bias-adjusted Kappa is reported in order to account for bias introduced due to low prevalence of CHF.
†Level of agreement based on Landis and Koch classification

Table 583: Gullett.

584 Emergency Department Use of Bioimpedance Vector Analysis to Assess Changes in Body Hydration

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Background: Adequacy of body fluid volume improves short- and long-term outcomes in patients with kidney disorders. Bioimpedance vector analysis (BIVA) is a noninvasive, rapid, and inexpensive bedside method of volume assessment. Using one electrode on the hand and one on the foot, BIVA calculates electrical resistance, capacitance, and phase angle of voltage and current. BIVA has been standardized to Caucasian populations with little data on other races.

Objectives: This study used BIVA in an inner city county hospital Emergency Department (ED) to assess volume overload (VOL) in primarily Hispanic/Latino patients and compare results of BIVA with a standard approach to volume determination

Methods: For patients who presented with VOL, we measured weight and conducted the BIVA assessment both pre- and post-treatment for VOL. Hydration was measured in terms of both fluid volume removed and weight lost after treatment.

Results: Enrollment included 25 patients: 13 (52.0%) female; 12 (48.0%) male; and 23 (92.0%) Hispanic. Ages ranged from 26-71 years (Mean=47.28; SD=11.27). Gender and race correlated with pre/post weight but not with hydration or volume of fluid removed. Age correlated positively with pre-treatment VOL measured by BIVA (r=.439; p-.028), and negatively with pre-treatment capacitance (r=-.479, p=.015; both pre- (r=-.466; p=.019) and post-treatment electrical resistance (r=-.423; p=.035). Fluid volume removed correlated with pre/post treatment weight loss (r=.490, p=.013). Post-treatment hydration did not correlate with fluid removed or with post-treatment weight. However, components of BIVA correlated positively with pre-treatment electrical resistance, negatively with post-treatment volume of fluid removed (r=-.438; p=.028), pre-treatment hydration (r=-.643; p=.001) and patient age (r=-.466; p=.019). Post-treatment electrical resistance correlated negatively with post-treatment hydration (r=-.839; p=.001) and patient age (r=-.423; p=.035).

Conclusion: In this study, components of the BIVA assessment correlated with various elements of hydration before and after treatment for VOL. Additional studies should be conducted in settings with larger samples from diverse patient populations to confirm appropriate use of this noninvasive, rapid, and inexpensive bedside method of volume assessment.

Figure 584 – Almasary

585 Interventions Given During "Door-to-Balloon" Time to Reduce Reperfusion Injury: Preclinical Testing of Novel Cardiac Drug Candidates

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Background: After an acute myocardial infarction (AMI), the standard of care is abrupt reperfusion therapy to restore flow to an occluded coronary artery. Unfortunately, despite the improved patient outcomes following percutaneous coronary intervention (PCI), reflow itself can cause a 'second wave' of oxidative stressors leading to additional irreversible myocyte damage and cardiac dysfunction not attributed by ischemia alone.

Objectives: This study identified a new family of amine oxidases as novel targets to mitigate tissue damage caused by reperfusion therapy. In particular, we hypothesized that newly designed inhibitors with low toxicity profiles could be utilized at the onset of AMI symptoms during the crucial "Door-to-Balloon Time" - either by EMS, ER staff, or prior to cardiac catheterization - to blunt cardiac damage caused by PCI.

Methods: This study utilized an *in vivo* murine model of left anterior descending (LAD) coronary artery ligation-reperfusion to mimic PCI therapy. Our lead compound, C1, was dosed at the onset of ischemia of the LAD, followed by reperfusion of the artery. After 7-days post-surgery, a transthoracic echocardiogram was performed and various cardiac structural and functional parameters were measured.

Results: C1 significantly reduced the systolic dysfunction caused by reperfusion therapy. Ejection fraction, end diastolic volume, cardiac output, and fractional shortening all improved in C1 treated mice as compared to vehicle n=5-7, p-value < 0.05). In addition, C1 reduced infarction.

Conclusion: These results demonstrate that amine oxidase inhibitors can be utilized in an acute setting to reduce post-catheterization cardiac dysfunction. Our preclinical results show novel strategies to improve patient outcomes through pharmacologic interventions after first medical contact and prior to PCI.

586 Acute Aortic Dissection: Inefficient and Wide Variation in CT Use for Diagnosis

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Background: Acute aortic dissection (AAD) is a life threatening condition making early diagnosis critical. Although 90% present with acute pain the myriad of associated symptoms can make investigation and diagnosis a challenge.

Objectives: To assess emergency physician use of CT in those presenting with pain for diagnosis of AAD specifically, utilization, yield and variation in ordering among physicians.

Methods: Retrospective cohort study of consecutive patients presenting to two tertiary academic care EDs for one calendar year with primary complaint of non-traumatic chest, back, abdominal or flank pain. Patients were excluded if clear diagnosis made by basic investigations (i.e. plain films) or exam (i.e. abscess). Primary outcome was number of CT Thorax or Thorax/Abdomen ordered to rule out AAD. Secondary outcome was variation in CT ordering. Variation was measured using proportion of positive CTs (z-test) and mean CTs (t-test) ordered between high (>5CT/yr) and low (≤5CT/yr) test users.

Results: A total of 26,932 out of 31,201 were included (Mean 47 yrs [IQR 31-62 yrs], 56.2% Female). Most common diagnoses: Chest pain (23.3%), Abdominal pain (20.8%), Lower back pain (10.5%), Renal Colic (5.3%), Female reproductive pathology (3.0%), Biliary disease (2.3%), ACS (2.9%), and Colitis/diverticulitis (2.3%). CT was ordered in 175 (0.6%) (Mean 62 yrs(IQR25-79 yrs) 50.6% Female) to specifically rule out AAD. Only 4/175(2.3%) (Mean 58yrs, (IQR31-62yrs) 25% female) were found to have an ADD. Percentage of CT's ordered per physician ranged from 0.6% to 12%. There was significant difference in mean number of CT's ordered (p≤0.001) but no difference in number of

AAD found (p≤0.2) between high (Mean 7.9 n=10 AAD=2) and low test users (Mean 2.3 n=41 AAD=2). No AAD were missed.

Conclusion: Current practice for the diagnosis of AAD is inefficient, with 98% of advanced imaging negative for AAD. There is significant variation in CT ordering (almost 20-fold) without an increase in diagnosis. These findings suggest great potential for more standardized and efficient use of CT for the diagnosis of AAD.

587 Patients with Alcohol Related Emergencies Have Long QTc Intervals

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Background: Alcohol intoxication and withdrawal are common presentations to EDs and can be serious or fatal. Although the exact mechanism contributing to death is unknown, previous studies show cardiac arrhythmias may be a cause. Among these patients, QT interval prolongation has not been investigated as a possible association with sudden cardiac death.

Objectives: Our hypothesis was that patients with alcohol related emergencies would have prolonged corrected QT intervals (QTcs).

Methods: The inclusive dates of this retrospective review were October 2013-June 2014. At our institution all subjects in whom an EKG, serum osmolality and alcohol level was recorded within two hours of each other were included. We excluded patients with incomplete data, those having EKG, serum osmolality and alcohol levels outside of 2 hours from each other. EKG QTc as well as electrolytes, anion gap and lactates where available were recorded. Data was extracted by two investigators with a 10% sample re-evaluated by the other extractor as a reliability measure. Prolonged QTc was defined as >450ms for men and >470 ms for women. Descriptive statistics including medians and interquartile ranges were measured for discrete variables. A Pearson Correlation was measured for the QTc vs. the variables as well. Significance was considered at $p<0.05$.

Results: 50 subjects fit the inclusion criteria. Agreement in the 10% sampling between investigators was high. QTc prolongation was found in 24/36 (67%, 95%CI: 50, 80) of males and 5/12 (42%, 95%CI: 19, 68) of females. Admission to the hospital was not correlated with length of QTc nor with osmolarity or osmolar gap. QTc length was significantly associated with anion gap (r=0.38) and lactate (r=0.44). There were no other significant correlations with the QTc. The table summarizes the results

Conclusion: A majority of patients presenting with alcohol withdrawal or intoxication who had EKGs and osmolarity checked in our institution had long QTc. QTc prolongation correlated with elevated anion gap and elevated lactate and likelihood of admission was high. Alcoholics may be at risk for Cardiac arrhythmias due to long QTc.

	MEDIANS (IQR)
Age	48 (35,55)
First Alcohol level	7 (0,203)
QTc	467 (449,491)
Heartrate	100 (84,115)
Anion Gap	14.5 (12,18)
Glucose	112 (95,162)
Lactate	2.8 (1.7,5.2)
Calculated osmolarity	292 (284,299)
Laboratory osmolarity	315 (294,351)
Osmolar Gap	19 (6,56)

Table 587: Chu.

588 Standardized Patient-Reported Outcome Measures After Acute PE Show Decline in Physical and Social Function at 30 Days

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Background: Pulmonary embolism (PE) can result in reduced physical function, pain, anxiety and other insults to quality of life. This can be as important to patients as more rare events. The NIH developed the Patient Reported Outcome Measurement Information System (PROMIS) allows standardized assessment of health state, comparison to a non-ill population, and can be followed over time.

Objectives: Demonstrate feasibility of PROMIS-29 multi-domain profile to measure patient reported health state in acute PE.

Methods: Prospective observational study of acute PE. Excluded: cognitive impairment, chronic or asymptomatic PE, terminal disease, inability for follow-up. Consenting patients completed 29 question webform within 24 hours of CT, then at 30 days were emailed the same webform. PROMIS-29 includes: physical function, anxiety, depression, fatigue, sleep disturbance, social participation, and pain interference. PROMIS scores are converted to a standardized T-score where 50 corresponds to the mean for a non-ill population with +/-10 = one standard deviation. Wilcoxon signed rank sum test for significance of paired non-normally distributed data.

Results: 273 PE patients identified over 14 months; 146 excluded; 52 refused, 75 consented. Mean age=54, 51% male, 11% active cancer, 11% recent surgery, 27% sub-massive PE, 72% PE without right heart strain. 56% treated with direct oral anticoagulants. Follow-up available in 54 subjects at median 41 days. There was no difference in age or gender among those with vs. without follow-up. Median T scores showed decline in fatigue and sleep disturbance; No change in anxiety or depression. (table 1) Quality of life, decline in physical function and ability to participate in social roles/activities (fig 1) was significant with median 30d follow-up values representing more than one standard deviation below a comparison reference non-ill population (T score<40).

Courtney table 1. PROMIS Measure changes after acute PE

PROMIS DOMAIN	Median at diagnosis		Median at 30d followup	difference	p value Wilcoxon signed rank sum test test
Physical Function	43.4		26.9	-16.5	<0.001
Anxiety	55.8		48	-7.8	0.13
Depression	49		41	-8	0.30
Fatigue	55.1		48.6	-6.5	<0.001
Sleep disturbance	54.3		52.4	-1.9	0.01
Ability to participate in social roles and activities	51.9		37.3	-14.6	<0.001
Pain interference	58.5		41.6	-16.9	<0.001

Table 588: Kline.

Conclusion: Standardized patient reported quality of life assessment with PROMIS is feasible in PE and allows measurement of changes from diagnosis to convalescence and comparison to a non-ill reference population. Patients reported significant decline in physical function and ability to participate in social roles and activities one-month post diagnosis. Enrollment is ongoing to allow stratification by PE severity and treatment.

589 Physician Perception of Patient Affect in Patients with Suspected Pulmonary Embolism

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Background: This work asserts that clinicians use patient affect to as part of gestalt assessment of presence of disease (sick or not sick). Prior work found reduced affect variability in patients with cardiopulmonary emergent conditions. No study has examined physician impression of patient affect in relation to pretest probability specific to PE.

Objectives: We conducted a prospective study of diagnostic accuracy to test the hypothesis that patients with PE smile less than patients who have no PE.

Methods: Single center study of diagnostic accuracy. Patients were selected for CTPA scanning as part of usual care and a research coordinator enrolled the patient prior to results of the CTPA. Clinicians who ordered the CTPA provided their gestalt pretest probability on a 0-100% scale, their belief as to whether an alternative diagnosis was more likely than PE, and answered the question "Did the patient smile during your exam?" These questions were answered prior to results of the CTPA. Criterion standard was acute PE on CTPA interpreted by a board certified radiologist and any patient with proximal DVT regardless of CTPA result and clinical decision to treat with anticoagulation.

Results: We enrolled 210 patients including 23 with PE+ on CTPA and four with DVT (27 with criterion standard). Clinicians indicated that more patients with PE smiled (17/27, 63%) compared with patients without PE (72/183, 39%, p=0.02, Chi Square). Clinician perception of smile vs. no smile was associated with neither a difference in the proportion who believed the patient had an alternative diagnosis to PE (28% vs. 34%, p=0.31, Chi Square) nor in the gestalt pretest probability of PE on a 0-100% scale (28±23.6% vs. 32±21.6%, p=0.25, unpaired t-test). Secondary comparison of gestalt pretest probability showed no difference between patients with PE and those without PE based upon perception of smile.

Conclusion: These surprising data indicated that clinicians perceive smile more often among patients with PE than patients without PE, and the data suggest that clinicians execute gestalt pretest processing independently from their perception of whether or not the patient smiled during the exam. These data imply that affect analysis for pretest probability assessment cannot be reduced to a single emotion.

590 A Multidisciplinary Pulmonary Embolism Response Team (PERT): Initial 30-Month Experience with a Novel Approach to Delivery of Care to Patients with Sub-Massive and Massive PE

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Background: Our Pulmonary Embolism Response Team (PERT) provides multi-specialty collaborative care for patients with severe PE.

Objectives: Describe a longitudinal analysis of treatments and outcomes among PERT patients.

Methods: We recorded data on consecutive patients treated by PERT including clinical presentation, test results, treatment, and outcomes through 365 days. The Partners HealthCare IRB approved the study. We performed Fisher's exact tests and regression analysis to test for trends.

Results: In 30 months, there were 394 PERT activations. Activations increased by an average of 16% per 6 month period (p_{trend} <0.01) (Figure 1). 227 (58%) activations came from the ED, 78 (20%) from an ICU, 56 (14%) from a medical floor, 18 (5%) from a surgical floor. The mean age was 61±16 yrs. and 212 (54%) were male (54%). The mean Charlson Comorbidity Index (CCI) score was 2.6±2.8. 216 (69%) of PE were in a main pulmonary artery (PA), saddle or intracardiac and 158 (50%) also had deep vein thrombosis (DVT). The majority of confirmed

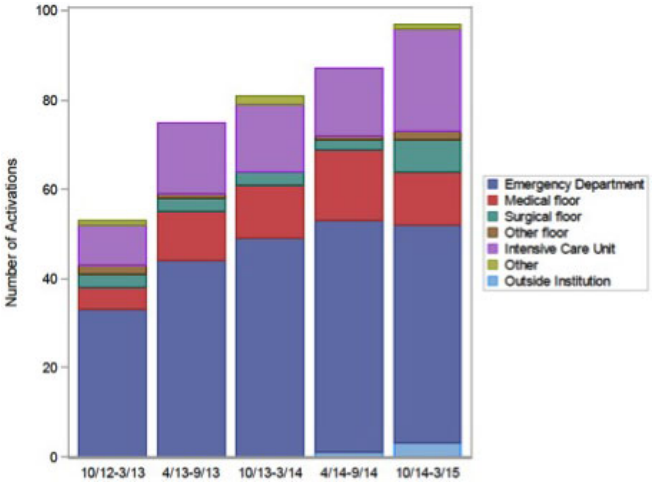

Figure 590 – Kabrhel

PE were submassive (n=143, 46%) or massive (n=80, 25%) and most patients (n=204, 65%) had evidence of right heart strain on echocardiography or CTPA. PERT treated (n=35, 11%), with systemic or catheter-directed thrombolysis (CDT) though the most common treatment was anticoagulation alone (n=215, 69%). Hemorrhagic complications occurred within 7 days in 25 (8%) and within 30 days in 36 (14%) patients. Bleeding was similar among patients treated with catheter directed thrombolysis (1/28 (4%) in 7 days and 3/27 (11%) in 30 days) and patients treated with anticoagulation alone (8/209 (4%) in 7 days and 17/179 (10%) in 30 days). The 30-day mortality was 12% for PE overall and 25% in patients with massive PE (p<0.01).

Conclusion: The PERT approach was rapidly adopted and sustained over time and facilitated access to advanced treatments for PE, with similar bleeding in CDT and anticoagulated patients. The PERT paradigm may represent a new standard-of-care for patients with PE.

591 Impact of Increasing Straight Stick Use for Blood Sample Collection on ED Hemolysis Rates

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Background: Hemolysis is a significant problem in the ED associated with increased costs and delays of care. We implemented a multi-faceted quality improvement project in the ED with the primary aim to improve hemolysis rates on blood samples. One initiative included increased use of straight sticks, which had been previously shown to be associated with lower rates of hemolysis when compared to the usual practice of obtaining samples during insertion of an intravenous catheter.

Objectives: The objective of this study was to determine the effect of an intervention to increase straight stick use in the ED on hemolysis rates in ED obtained blood samples.

Methods: This was a prospective interventional study in an urban tertiary care ED with annual volume of approximately 65,000 visits. The intervention to increase straight stick use was conducted among a select group of medics in the ED who were educated to increase use of straight sticks for lab draws. Utilizing data from the electronic medical record, we evaluated all potassium lab draws during two independent periods. The historical control period represented lab draws between 4/15/14-5/15/14 (n=834) and the comparative period represented draws

between 4/15/15-5/15/15 (n=1530) following the implementation of the intervention. Rates of hemolysis and subsets of hemolysis with comment and gross hemolysis were compared with chi-square tests and a type-I error of 0.05. Statistical analyses were performed with SAS (v.9.4, Cary, NC).

Results: The overall hemolysis rate during the control period was 13.8%(115/834). Following the intervention, straight stick use significantly increased relative to the historical period (14.1% vs 5.3%, p<0.001) and hemolysis rates declined to 9.5% (146/1530) (p<0.001). Hemolysis rate with comment was also lower after the intervention (6.7% vs. 9.5%, p=0.01) while there was also a trend towards lower gross hemolysis rates (2.9% vs. 4.3%, p=0.06).

Conclusion: An intervention to increase straight stick use in the ED for blood draws significantly increased utilization of straight sticks and significantly reduced hemolysis rates.

592 Impact of Hemolyzed Blood Specimens On Emergency Department Patient Throughput

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Background: Emergency departments have been identified as a location with high hemolysis rates on blood samples.

Objectives: ED throughput metrics are publicly reported CMS measures. Long lengths of stay (LOS) appear to be directly correlated with patient safety events and inversely correlated with patient experience scores. There is limited evidence to suggest that hemolyzed blood specimens may play a role in longer LOS. The purpose of this study was to assess the impact of hemolyzed blood samples on patient LOS in the ED.

Methods: Secondary analysis of a performance improvement project aimed at reducing rates of hemolysis in ED blood samples. Setting: urban, academic, tertiary referral ED with annual census of 64,000 visits. All ED patient visits between January 2014 to March 2014 where a potassium level was reported were included in the analysis. The electronic medical record (EMR) was queried for potassium results, as well as patient throughput times (including arrival, disposition decision, and discharge). Throughput was measured from time of arrival to time of disposition decision. Throughput times were stratified according to ED disposition (admitted vs. discharged) as well as potassium sample quality (normal vs. hemolyzed, grossly or mildly with comment). Two-tailed t-tests were used to compare throughput between patients with and without hemolysis using type-I error probability of 0.05.

Results: In the first quarter of 2014, there were 14,191 patients seen in the ED, 3,164 (22.3%)) admitted and 11,027 discharged (77.7%). Among admitted patients, 2,937 (92.8%) had potassium values reported, compared to 3,859 (35.0%) among discharged patients. The mean throughput time for discharged patients was shorter in the group without hemolysis (458 minutes; 95% CI, 448-468vs. 507 minutes; 95% CI, 479-535) (p=0.009). The mean throughput time for admitted patients was also shorter in the group without hemolysis (266 minutes; 95% CI, 262-270vs. 289 minutes; 95% CI, 279-299) (p=0.048).

Conclusion: Hemolysis rates appear directly correlated with length of stay. Reduced hemolysis rates in the ED may lead to significantly improved throughput metrics.

593 Getting Fast-track Patients Out: Implementation of Point of Care iSTAT Testing in a Safety-Net Hospital

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Background: Point-of-care tests (POCT) have potential to improve patient safety and facilitate more rapid disposition in the Emergency Department (ED) setting. The iSTAT POCT, which provides results of a chemistry 7 and hemoglobin within 5 minutes, was introduced into a large, urban, County ED (annual census >175,000) with long wait-times and significant overcrowding.

Objectives: To compare ED metrics before and after implementation of iSTAT POCT to ascertain whether the use of iSTAT would facilitate shorter ED length of stay (LOS) by providing rapid results for low-acuity patients who needed only basic lab results prior to discharge.

Methods: ED operational metrics including arrival to MD evaluation (MDeval), MD evaluation to disposition (MD-dispo), and LOS were measured on all patients who had either a venous blood gas or a basic metabolic panel (tests for which the iSTAT could substitute) during a 6-month period prior to iSTAT implementation. Metrics were stratified based on ED pod, Emergency Severity Index (ESI), and disposition. These same metrics were also collected on patients with an iSTAT drawn during the 6 months following implementation.

Results: There were 52,045 and 3,154 patients prior to and post iSTAT implementation, respectively. Results reported as averages. ED metrics improved consistently in lower-acuity patients only, especially when they were seen in fast-track pods. When the two fast-track pods were analyzed, average MD-eval times were reduced by 33.5 min, 73.3 min, and 38 min for ESI of 3, 4, and 5, respectively. MD-dispo times were reduced by 19.5 min, 48 min, and 12 min for ESI 3, 4, and 5, respectively. Likewise LOS demonstrated a reduction of 67.5 min, 127 min, and 48 min for ESI 3, 4, and 5, respectively. When all the pods are analyzed, there was no reduction in the metrics for ESI 3 patients, although improvements held in ESI 4 and 5 patients.

Conclusion: This comparison study before and after the introduction of iSTAT POCT demonstrates that key ED operational metrics (arrival to doctor, MD to disposition, and LOS) are reduced in lower acuity, fast-track patients within a large safety-net ED. Other EDs with patient flow problems may benefit from implementation of POCT.

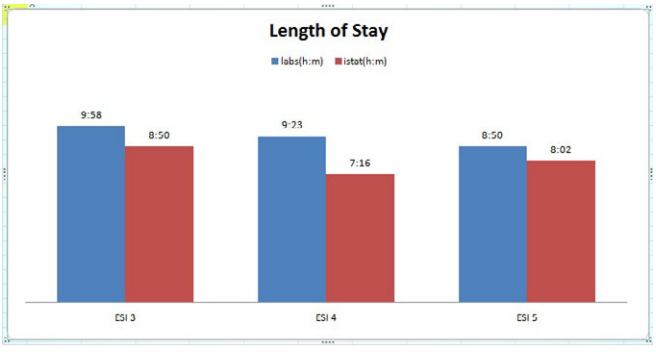

Figure 593 – Cheffers

594 A Systematic Review of Nursing Workload Measures

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Background: Optimizing medical care under tightening hospital budgets requires efficient distribution of resources across hospital settings. Nursing work is a crucial resource; excessive workload has been linked to morbidity and mortality. Nurse:patient ratios, the most widely-used measure of nursing work, is an overly blunt instrument.

Table 1. Rabin: Nursing Workload Measures Meeting Criteria

Models	Study Setting	Validation Setting	Weighting Factors	Factors Relevant to the ED
Therapeutic Intervention Scoring System (TISS-28)	ICU	22 Danish ICUs	Severity of illness	20/28 (71%)
Nine Equivalents of Nursing Manpower Use Score (NEMS Score) (Consolidated TISS-28)	ICU	64 ICUs, 11 European countries	Severity of illness	7/9 (78%)
Nursing Activities Score (NAS) (Replaced TISS-28)	ICU	99 ICUs, 15 countries	Length of time	67% (20/30)
Workload Indicator for Nursing (WiN-Score)	ICU, medical/ surgical wards	23 wards, 4 hospitals in Belgium	Length of time	78 items based on Belgian Minimum Dataset, not available
Nursing Intervention Classification (NIC)	Orthopedics ward	42 bed orthopedics ward, United States	Length of time	514 items, complete list not available
Time-Oriented Score System (TOSS)	ICU	2710 patients, 14 ICUs, United States	Length of time, number of occurrence per patient per day	57% (8/14)
Comprehensive Nursing Intervention Score (CNIS)	ICU	25 ICU nurses, academic hospital in Japan	Length of time, number of nurses, job intensity, muscular exertion, mental stress, special skills	55% (40/73)

Objectives: To perform a systematic literature review to identify rigorously-developed and validated nursing workload measures which apply to, or may be adapted for, use in the ED and across hospital settings.

Methods: We searched PubMed, Cochrane, Web of Science, Google Scholar, and CINAHL from 1/1/2000 to 5/14/14 for research studies in English. We searched using at least one term from each of the following categories: [nursing, nurs*], [workload, work, intensity], [score, measure*, model, tasks]. Based on previously described requirements for a Minimum Clinical Dataset, workload measure inclusion required 1. use of an objective scoring system developed via a Delphi method, time studies +/- work sampling, and weighing of tasks by time or illness severity, and 2. internal and external validation. The portion of scored items applicable to EDs was noted.

Results: 1765 total articles were identified, 729 relevant to nursing workload models. 197 articles on 7 measures (Table 1) met inclusion criteria. 5 measures had publicly-available items. No measures were validated in the ED but 55-78% of available measured items are relevant to the ED. Sample items are listed in Table 1. 6 models were validated in an (Intensive Care Unit) ICU, 1 on inpatient wards. Models were developed in the US (2), Japan (1), and Europe (4). 6 were validated in multiple institutions. Most measured items are easily searchable in common electronic health record systems.

Conclusion: Existing rigorously-tested nursing workload measures are primarily validated in ICUs. Many of their elements overlap, are easily retrievable electronically and are relevant to ED nursing work. Validation of one or more of these measures across hospital settings is feasible and could instruct resource distribution.

595 What Non-Physician Factors Affect Length of Stay in the ED?

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Background: Length of stay in the ED is a frequently used metric to evaluate both department and individual physician performance.

Objectives: The purpose of our study is to evaluate what factors independent of individual provider's performance affect length of stay in the Emergency Department. Better understanding of these relationships could lead to improved planning and allocation of resources.

Methods: Our study utilized a retrospective review of visit records from January 1, 2014 to May 30, 2015. All discharged patients over 18 years who visited the two emergency departments of a single institution in an urban area in this time period were included. This yielded a total of 68,168 records. A large sample size was chosen to minimize the effect individual providers had on discharge time and to minimize the influence of unmeasured effects unique to each patient encounter. We utilized linear regression to observe the effects of several independent variables on our dependent variable of interest, length of stay (LOS). We included arrival by EMS, day or night shift arrival, whether a consult was ordered, presence of fever, and day of the week.

Results: The mean length of stay was 294.5 minutes. Table 1 shows the results of the linear regression. The results were notable for statistically significant ($p<0.05$) positive coefficients for Age, Ambulance Arrival, Ordering of Consults, Night Shift, Monday, and Fever. Negative coefficients for Acuity (1-5 with 5 representing lowest acuity), Thursday, and Sunday were also statistically significant.

Conclusion: Our results largely confirm intuitive relationships between our independent variables and length of stay. Patients with more concerning presentations, as represented by higher acuity, arrival by ambulance and fever, had longer visits. Older patients were also associated with longer stays. The ordering of consults had a strong effect on length of stay most likely related to both the complexity of the encounter and the delay in obtaining a consult. This study identifies several significant factors that affect visit time and could be further refined and applied to additional data to better understand the dynamics of ED operations in many situations.

Table 1

VARIABLES	(1) Length of Stay
Age at Visit	0.860***
	(0.0339)
Acuity	-71.27***
	(1.070)
Main Campus	11.07***
	(1.252)
EMS Arrival	53.62***
	(1.471)
Consult Ordered	135.0***
	(1.982)
Night Shift	2.372**
	(1.192)
Monday	5.530**
	(2.188)
Tuesday	-0.984
	(2.199)
Thursday	-4.587**
	(2.186)
Friday	-1.125
	(2.199)
Saturday	-4.243*
	(2.195)
Sunday	-6.817***
	(2.194)
Fever	4.428**
	(1.841)
Constant	274.8***
	(68.17)
Observations	68,168
R-squared	0.193

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 595: Christian Smith.

596 The Effects of Shift Work on the Driving Performance of Emergency Medicine Residents: A Pilot Study

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Background: Emergency medicine (EM) residents work varying shifts to fulfill clinical obligations. Shiftwork has been associated with an increased risk for motor vehicle crashes in medical trainees, however this has never been objectively assessed for EM residents.

Objectives: Our objective is to study the effects of shiftwork on the driving performance of EM residents using a driving simulator.

Methods: Twelve volunteer EM residents, (6 PGY 1 and 6 PGY3) were tested using the STISIM3® Driving Simulator in a randomized pre-test/post-test study. Each subject completed a 10-minute driving simulation pre-shift and a 10 minute simulation post-shift. These EM residents have a progressive 6-day shift work schedule. The PGY1s work 10-hour shifts and the PGY3s work 8-hour shifts. Standard driving parameters were studied including reaction time (RT), standard deviation of lateral positioning (SDLP), and divided attention (DA). The difference between pre- and post-shift for each parameter was calculated and analyzed with mixed analysis of variance (ANOVA) using SPSS 22.

Results: Results are summarized in table 1. All residents performed worse on RT post shift regardless of the shift time or level of training. The decrement in performance did not vary significantly by the shift worked or the year of training. For SDLP, PGY1s and PGY3s performed worse after day shift, and they performed better after swing shifts. PGY3s performed better after night shifts, whereas the PGY1s performed worse after night shift. The performance approached statistical significance for shift time (p=0.06), however it was not statistically significant for the year of training. For DA, PGY1s driving improved after day shift and after night shift, however they performed worse after the swing shift. Whereas PGY3s performed worse on DA across all shifts. Their performance did not rise to statistical significance by shift worked or year of training.

Conclusion: The data in this pilot study suggests that shift work may imair EM resident driving performance with regards to the specific driving parameters. Further trials using a larger sample size are planned in order to elucidate more fully the effects of shift work on driving performance of EM residents.

597 Physician Assistant Productivity and Utilization in an Urban ED

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Background: Previous studies of physician assistants (PAs) in the ED have looked at wound care outcomes, length of stay on inpatient services and national prevalence. There are limited data on productivity with regards to patient throughput and quality measures such as CT/X-ray utilization. We evaluated the productivity changes in our PA group resulting from a departmental decision to have PAs work independently of attending physicians in our urgent care area. As of January 2015 the policy regarding PAs in the urgent care area of our urban ED was changed to allow patients with an ESI triage level of 4 or 5 to be managed independently of an attending physician.

Change in driving performance post-versus pre-shift stratified by year of training and time of shift

		Delta Reaction Time (RT) Seconds	Delta Standard Deviation of Lateral Positioning (SDLP) Feet	Delta Divided Attention (DA) seconds
PGY1	Day	0.040	0.264	-0.181
	Swing	0.004	-0.367	0.032
	Night	0.037	0.077	-0.040
PGY3	Day	0.007	0.139	0.224
	Swing	0.174	-0.006	0.229
	Night	0.010	-0.120	0.085

*positive numbers indicate worsening in driving performance negative numbers indicate improvement in performance

Table 596: Mckeever.

Objectives: We hypothesized that PAs working independently would result in the PA group having a higher average rate of patients seen per hour by eliminating the delays inherent with the PA waiting for the attending physician to be free for evaluation and charting.

Methods: Monthly productivity reports for PAs were collected for June-December 2014 (pre-change) when every patient was managed directly with an attending. These data were compared to the period after the change went into effect March-August 2015 (post-change); March was chosen as opposed to January in order to ensure that all staff had a chance to get used to the new model. Means were compared with a two-tailed t-test.

Results: Patients per hour seen by PAs decreased significantly when they started working independently (1.85 pre; 1.58 post; $p<0.05$). The average time to discharge of patients seen by PAs increased from 1.93 to 2.03 hours post changes ($p<0.05$) and the percent of encounters with a CT scan ordered increased as well (5.39% pre; 6.92% post; $p<0.05$). There was no significant difference in the percent of patients that received an X-ray (20.72% pre; 21.32% post; $p=0.56$).

Conclusion: Contrary to our hypothesis, patients seen per hour decreased with changing to an independent practice model for our PA group. This could be the result of increased caution or a loss in efficiency with more independent practice; the increased CT utilization and time to discharge could be a reflection of this as well. The study is limited by its observational nature making it difficult to compare the exact same group pre/post changes with ongoing turnover in the PA group and inability to control for changes in departmental volume.

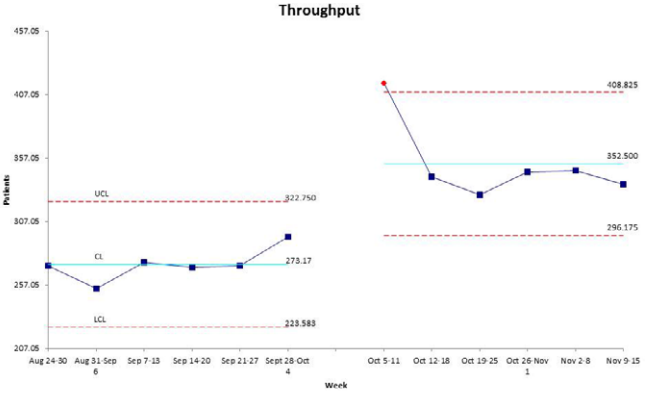

Figure 1. Control chart showing number of patients seen in ED pod per week for the 6 weeks prior and 6 weeks post lean project implementation (10/5/15). Points above UCL signify a statistically significant increase. UCL = upper control limit, LCL = lower control limit, CL = mean.

Figure 598 – Cheffers

598 Utilization of Lean Healthcare Principles to Improve Emergency Department Patient Flow in an Intermediate Acuity Area of a Safety-Net Hospital

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Background: Emergency Department (ED) overcrowding, patient boarding and inefficient patient flow are major problems affecting hospitals all over the United States. Long wait times, prolonged ED boarding, and critical patients being held in the ED lead to increased patient safety risk, decreased patient satisfaction, and increased number of patients leaving via nontraditional dispositions (LWBS, LBTC, AMA). Lean process improvement has been used in multiple industries to identify waste and increase value.

Objectives: We sought to use healthcare Lean tools to evaluate and improve the flow process in a safety-net hospital with dangerous overcrowding. One of the areas with the most opportunity for improvement was a 13-bed pod, which served as a "mid-track" for moderate acuity (ESI 3) patients who often fell to the bottom of the waiting room list.

Methods: Using Lean healthcare principles, the multidisciplinary ED Patient Flow Lean Team analyzed the flow process at an urban, safety-net, County hospital with annual ED census of >170,000. Identified waste was removed using patient staging within the pod, vertical care spaces, maintaining flow throughout the day with improved sign out procedures, improved triage criteria and patient placement into chairs/beds by nursing flow coordinators. Data was analyzed using run and control charts.

Results: Comparing the six weeks prior (8/24/15-10/4/15) to implementation of the lean changes to the six weeks post (10/5/15-11/15/15), the throughput in the ED pod increased 29% (from 273/week to 353/week), which was a statistically significant increase ($p<0.05$) (Figure 1). Median LOS for patients treated in the ED pod decreased 153 minutes (558 to 405 minutes) ($p<0.05$). Median doctor to disposition time stayed the same (110-127 minutes).

Conclusion: Without increasing physical space, staffing, or equipment, we were able to increase throughput in a 13-bed ED pod by 29% by using Lean healthcare principles and innovative patient flow design changes. These changes are a cost effective way to improve patient flow, safety, and satisfaction. Next steps are to spread these changes to other areas of the ED, urgent care and hospital to continue step-wise improvement in patient flow.

599 Comparison of Parasternal Long Axis and Carotid VTI to Apical 5-Chamber VTI for the Assessment of Fluid Responsiveness

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Background: Accurate assessment of fluid responsiveness remains a significant challenge in critically ill patients. Doppler measurements of stroke volume (SV) using left ventricular outflow tract velocity time integral (LVOT VTI) have been utilized to predict fluid responsiveness when combined with a passive leg raise (PLR) maneuver. Traditionally, the apical 5-chamber (A5C) view has been used for LVOT VTI; but its usefulness remains limited due to the considerable skill required to obtain it.

Objectives: The primary objective of this study is to determine if easier to obtain measurements from alternative sites such as parasternal long axis (PLAX) and carotid artery (CA), are equivalent to the A5C. A secondary objective is to evaluate CA Blood Flow as a measure of fluid responsiveness.

Methods: Healthy adult volunteers were recruited and consented. Subjects were placed in supine position with the head of the bed at 45 degrees and peripheral IV lines placed. Baseline non-invasive measurements of CO (NICOM), HR and SV were made. Five sets of Doppler tracings were obtained in the CA, PLAX, and A5C views. Doppler and NICOM measurements were repeated after PLR and again after a fluid bolus of 10cc/kg. Pearson correlation coefficients were calculated.

Results: 8 volunteers were recruited and 648 data points generated. Doppler measurements were made after all participants were scanned and were therefore blinded to the examiner during the study. Our data shows that CA VTI correlated well with A5C [r=0.65]. CA Flow also compared well to A5C [r=0.65] and ΔCA flow correlated very well with ΔA5C [r=0.74] after volume expansion. PLAX Doppler tracings suffered significant motion artifact and did not correlate as well with A5C.

Conclusion: PLAX views were easier to obtain than A5C but VTI measurements from this view did not correlate as strongly with A5C compared to those from CA. The PLAX Doppler tracings were of limited quality making measurements from this site less reliable. In contrast, high quality Doppler tracings from CA were easily obtained in

all cases. CA VTI and Blood Flow was comparable to A5C. The ΔCA Flow correlated very well with ΔA5C. The simplicity of obtaining measurements from CA and minimal skill level required suggests that CA Doppler may be a highly reproducible and useful marker of fluid responsiveness.

600 Presumption of Cardiopulmonary Resuscitation for Sustaining Cerebral Oxidation Using Regional Cerebral Saturation of Oxygen: Observational Cohort Study (Press Study)

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Background: AHA 2015 guideline recommends chest compression should be performed on the sternal bone at a level of bust point. As there is individual difference in the heart position, it remains to be clarified whether the recommended position of chest compression can be applied to everybody. The ratio of real-time low-oxygenized cerebral blood circulation represented by rSO2 (regional cerebral oxygen saturation) can be non-invasively and quantitatively measured using a near infrared-red spectroscopy (NIRS) sensor placed on the forehead. Therefore, rSO2 potentially enables us to monitor the effective cardiopulmonary resuscitation (CPR).

Objectives: The purpose of this study was to validate rSO2 monitoring on effectiveness of chest compression by investigation of relationship between arterial blood pressure and rSO2 in patients with out-of-hospital cardiac arrest (OHCA).

Methods: This study was a prospective observational study conducted at a tertiary emergency medical care center in Japan. Simultaneous systolic (SAP) and mean arterial pressure (MAP) through invasive arterial pressure monitoring, and rSO2 were measured at every 3 minutes during the CPR, and the relationships between absolute values and changes in the measurements were compared using two types of coefficient of correlation, within and between patients in order to perform statistical analysis considering repeated measurement taken from a single patient.

Results: There were 38 patients out of total 169 patients with OHCA fulfilled the inclusion criteria and 16 patients were finally included. Total measurement points were 29 points. Median value of the patient age was 82 years old (IQR 71-87). Male patient number was 14 (88%), and 81% patients were witnessed OHCA. Two types of coefficient of correlation between arterial pressure and rSO2 showed that the within patients' coefficient of correlation between MAP and rSO2 was 0.20 (95% CI:1.8-0.53), but the coefficient of the correlation between patients was 0.82 (95% CI:0.14-0.72).

Conclusion: There was correlation between rS02 and MAP during sternal chest compressions. Our results suggest that chest compression under rS02 monitoring improves outcome of the patients with OHCA.

601 Out-of-hospital Cardiac Arrest and Bystander CPR in Kent County, Michigan: A Geospatial Analysis

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Background: Geographic clustering of out-of-hospital cardiac arrest (OHCA) and bystander CPR (bCPR) has been demonstrated in some US cities. We assessed for geospatial patterns within our county.

Objectives: 1) Characterize bCPR performance; 2) Test for geographic clustering of OHCA and bCPR; 3) Identify hot spots and cold spots, defined as areas with disproportionately greater and lesser chance of bystander intervention within a concentration of OHCA. We hypothesized that OHCA and bCPR are geographically clustered within our region, resulting in hot and cold spots of bystander intervention.

Methods: Retrospective, observational, population-based, cohort study using the CARES dataset for Kent County, Michigan. We included adult, non-traumatic, EMS-treated OHCA from 2010-14, excluding cases with on-site medical care. We abstracted EMS dispatch addresses, bCPR, and patient characteristics, then geocoded street address (ArcGIS) into a population-adjusted density map of OHCA annual incidence. Moran's I test assessed for spatial autocorrelation of population-weighted cardiac arrest rate by census block. Difference mapping identified relative differences between cases with/without bCPR. Getis-Ord Gi statistic assessed for spatial clustering of bCPR.

Results: Of 1,632 eligible subjects, 1,167 met inclusion criteria. bCPR occurred in 436 (37%), and was performed by family members (58%), lay persons (34%), and off-duty medical providers (8%). Specific techniques included compressions/ventilations (28%), compression only (35%), ventilation only (1%), and unknown (36%). Geospatial analysis revealed significant clustering of OHCA ranging from 0 to >60 annual cases per 100,000 people ($p<0.001$). Relative difference in bCPR ranged from -11.2 to 0.9 across geographic locales, with a paucity of bCPR (-11.2 to -2.0) in urban and suburban areas. We identified central Grand Rapids and southern suburbs as primary cold spots (99% confidence), whereas eastern and northeastern suburbs contained hot spots (99% confidence).

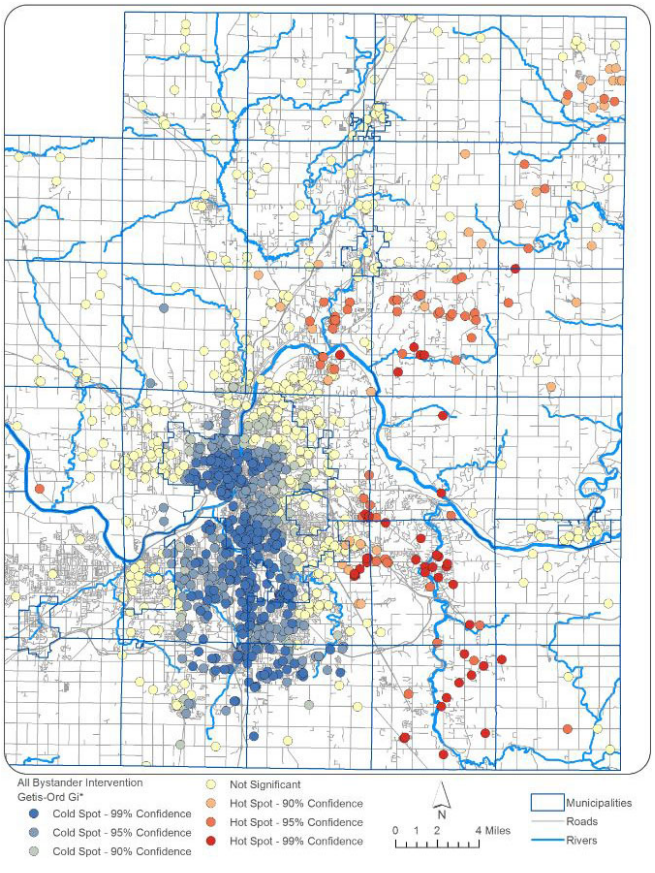

Figure 601 – Reynolds

Conclusion: The minority of OHCA received bCPR. OHCA and bCPR are geographically clustered, and bCPR is more/less likely to occur in certain areas. Distinguishing hot and cold spots affords opportunity for targeted public health initiatives.

602 The Effect of Body Habitus on Left Ventricular Volume Changes During Simulated CPR

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Background: Previous studies have demonstrated improved survival rates while following the American Heart Association (AHA) recommendations for CPR. However, surprisingly little research has been done to show the direct anatomical effects of chest compressions in support of these guidelines. Moreover, the AHA does not currently provide recommendations for tailoring CPR based on body habitus. Investigation into the biomechanical effect of CPR is therefore warranted.

Objectives: The goal of this study is to measure the change in left ventricular volume at increasing quasi-static chest compression depths on cadavers of different body habitus.

Methods: Cadavers were chosen in comparison to the 50th-percentile male (69.0 inches, 78.3 kg). Chest compression simulations were performed on one obese and one 50th-percentile subject at five compression depths: uncompressed, 1 inch, 2 inches, 3 inches, and 4 inches. Force was applied statically via direct compression of the sternum at the internipple line. CT images were obtained for each compression depth. Manual segmentation was used to generate 3D models of the left ventricle and to calculate volume.

Results: The body mass indices were 22.2 kg/m^2 in the normal weight subject and 33.9 kg/m^2 in the obese subject. For the normal weight subject, the changes in left ventricular volume were 13.35 mL, 29.87 mL, 32.60 mL, and 34.34 mL for compression depths of 1 inch, 2 inches, 3 inches, and 4 inches, respectively. For the obese subject, the changes in left ventricular volume were 0.23 mL, 0.72 mL, 8.68 mL, and 9.51 mL for compression depths of 1 inch, 2 inches, 3 inches, and 4 inches, respectively.

Conclusion: The results may prove useful for the understanding of CPR and its impact on the AHA guidelines. The results suggest that for the average male, chest compressions with depths greater than two inches provide the largest change in left ventricular volume, offering support for the AHA guidelines. Obese patients, however, may need deeper chest compressions than average patients to achieve comparable cardiac output. Furthermore, the overall smaller left ventricular volume change in the obese subject may suggest that in general, CPR has reduced efficacy in obese patients. Data collection is ongoing to clarify these results.

603 A Comparison of Chest Compression Quality During Supraglottic Airway Placement, Video and Direct Laryngoscopy in Simulated Cardiac Arrest

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Background: Current recommendations suggest that high-quality chest compressions (depth >2 inches, rate >100/minute, minimal interruptions) are associated with increased return of spontaneous circulation, survival and neurologic outcome. Airway management strategies such as supraglottic airway (SGA) placement, video laryngoscopy (VL) and direct laryngoscopy (DL) differ in their complexity and therefore may influence other critical tasks during resuscitation such as maintaining high-quality chest compressions.

Objectives: To evaluate if airway management during simulated cardiac arrest utilizing SGA improves quality of chest compressions and time to airway device placement, compared to VL and DL.

Methods: A prospective, simulation-based, randomized trial with 29 Emergency Medicine residents. Participants were randomly assigned to teams with one member directed to airway device placement and the other to chest compressions. Participant roles switched after each maneuver was completed. Primary outcomes were compression depth and rate before, during and after airway placement, and time to airway procedure completion. Subgroup analysis was performed for participants who were able to achieve high-quality chest compressions during a practice phase prior to the scenario.

Results: Time to airway device placement was SGA=21.1s, DL=44.2s, VL=29.3s (p= .0001). 52% (15/29) of participants achieved high quality chest compressions during the practice phase. Of these participants, during the scenario there was no statistically significant difference in deterioration of chest compression rate over time. A statistically significant difference was observed in percentage of compressions > 2 inches before and during DL and SGA airway maneuver P <0.0001.

Conclusion: SGA is the most rapid airway maneuver during simulated cardiac arrest. Compression depth is compromised during DL and placement of SGA. Further investigation is needed to determine the cause and potential mitigating strategies. Focus on quality of compressions is particularly important while other invasive procedures are being performed.

Table 1: Percentage of compressions with depth greater than or equal to 2 inches, before, during, and after airway maneuver by high quality compression participants

	VL	DL	SGA
Before airway	89.99%	92.04%	98.76%
During airway	76.75%	91.38%	71.61%
After airway	82.51%	90.17%	90.20%
Before vs. During p =	**0.1496**	**<0.0001**	**<0.0001**
During vs. After p =	**0.9219**	**<0.0001**	**0.317**

Table 603: Foster.

604 Impact of a Standardized Post-Arrest Clinical Pathway and Quality Improvement Tool on Three Receiving Cardiac Resuscitation Centers Within a Single Healthcare System

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Background: Current guidelines endorse regionalized cardiac resuscitation centers (CRC) to deliver comprehensive post-cardiac arrest (CA) care. We developed and disseminated a standardized post-CA clinical pathway and quality improvement (QI) tool within our 35-hospital regional healthcare system in 2014.

Objectives: To determine the impact of the post-CA clinical pathway on outcomes at three different CRCs.

Methods: Retrospective analysis of our therapeutic hypothermia registry of adult CA patients, comparing outcomes pre- (Nov 2007 to June 2014) and post-implementation (July 2015 to Sept 2015). The intervention included computer-based videos, standardized order sets, nurse/physician champion teams, and quarterly system-wide collaborative conference calls. The primary outcome was good neurological outcome at hospital discharge after witnessed shockable CA, defined as Pittsburgh cerebral performance category (CPC) 1-2.

Results: Of 956 post-arrest patients during the study period, median age was 59 (IQR 50-69) years, 888 (92.9%) were out of hospital cardiac arrests (OHCAs), 768 (80.3%) had a witnessed arrest, and 505 (52.8%) with an initial shockable rhythm. A total of 538 (56.3%) survived to hospital discharge, including 351/956 (36.7%) with a good neurologic outcome. For witnessed shockable OHCA (n=414), there was no difference in good neurologic outcome pre-intervention (56.2%)

compared to post-intervention (47.3%) (p=0.13). Analyzing each individual hospital, there was no difference in good neurologic outcome pre- and post-intervention for witnessed shockable OHCA [A: 57.2% vs 49.1% (n=255 vs 57; p=0.26); B: 44.1% vs 47.6% (n=34 vs 21; p=0.80); C: 60.6% vs 38.5% (n=33 vs 13; p=0.17)]. Finally, there was no difference in outcomes between the 3 facilities (aggregate over the pre/post time period) with A 55.7% (n=312), B 45.6% (n=55), and C 54.4% (n=46) (p=0.37).

Conclusion: Implementation of a standardized post-cardiac arrest clinical pathway and QI tool was not associated with improved outcomes in patients after witnessed, shockable OHCA.

605 Paramedics Provide a Different Mean Ventilation Rate Compared to In-Hospital Emergency Providers During Simulated Cardiac Arrest

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Background: Hyperventilation during CPR increases intrathoracic pressure, decreases coronary perfusion pressures, and likely decreases survival. As resuscitation care is multidisciplinary, understanding differences among provider groups is important.

Objectives: We compared ventilation rates among three groups of providers (EM residents, ED nurses, and paramedics) during a simulated cardiac arrest.

Methods: In this prospective simulation study, EM residents, ED nurses, and paramedics performed CPR during a cardiac arrest simulation. Using a manikin with a definitive airway in place, a total of 60 participants (20 in each group) performed 4 rounds (8 minutes) of CPR in teams of two. An investigator recorded the time at which each ventilation was initiated. The study participants were blinded to the recorded variables.

Results: The mean ventilations per minute (VPM) for each group was as follows: residents 9.3625 (95% CI = 8.13 to 10.6), nurses 9.9875 (95% CI = 8.99 to 10.99), and paramedics 7.45 (95% CI = 6.8 to 8.1). A Student's t-test showed nurses gave 2.54 more VPM than paramedics (p = 0.0004). Residents gave 1.91 more VPM than paramedics (p = 0.0067). Residents gave 0.63 more VPM than nurses, not a statistically significant difference (p = 0.37). One-way analysis of variance (ANOVA) confirmed that paramedics gave fewer VPM than the other groups (p = 0.001). The mean interval between ventilations for each group in seconds was as follows: residents 6.998 (95% CI = 6.35 to 7.64), nurses 6.56 (95% CI = 5.9 to 7.22), and paramedics 8.613 (95% CI = 7.71 to 9.53). A Student's t-test showed the paramedic interval was 2.06 seconds longer than the nurse interval (p = 0.0001) and 1.62 seconds longer than the resident interval (p = 0.0024). The resident interval was 0.44 seconds longer than the nurse interval, not a statistically significant difference (p = 0.4). ANOVA confirmed that paramedics had the longest interval (p = 0.0003).

Conclusion: Prior studies have found hyperventilation in both the hospital and pre-hospital setting. In our study, hyperventilation was not found; the mean VPM of residents and nurses fell within the AHA guideline of 8 to 10 breaths per minute, while the paramedic mean VPM fell below it. The Hawthorne effect may have contributed to lower VPM among all groups. The effect of mild hypoventilation is largely unknown and warrants further study.

606 Impact of an Automated Chest Compression Device on Team Communication During Simulated Emergency Department Cardiac Arrest Resuscitations: A Pilot Study

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Background: Communication and teamwork failures correlate with Emergency Department (ED) errors and deviations from ACLS protocols during cardiac arrest (CA) resuscitation. High task workloads stress teams' capacity and negatively impact team effectiveness. The LUCAS Chest Compression System (Physio-Control, Redmond, WA) is an automated chest compression device intended to reduce workload associated with chest compression delivery.

Objectives: To assess the impact of LUCAS on team communication and adherence to ACLS algorithms during a simulated ED CA.

Methods: Resuscitation teams (n=12) were randomly assigned to manual compressions (control) or LUCAS (intervention) during a simulated CA consisting of Phase 1, pre-arrest (Baseline), and Phase 2, ventricular fibrillation phase (Arrest). Phase 1 metrics included total team communication statements and 10 patient care actions. Phase 2 communication was measured as number of statements related to (a) CPR coordination, (b) compression performance, and (c) diagnosis. Phase 2 patient care metrics included (a) adherence to ACLS algorithm and (b) quality of compressions. Statistical analyses included descriptive statistics, paired t-test, and effect size (Hedge's g).

Results: In Phase 1 there was no difference in either communication or patient care outcomes. In Phase 2, teams in the intervention group (n=6) made more frequent statements focused on diagnosis (Hedge's g = 1.88, t[df 10]=3.53, p=0.01) and fewer directed toward CPR coordination (Hedge's g = -0.98, t[df 10] = -1.85, p = 0.1) and compression performance (Hedge's g = -1.55, t[df 10]=-2.91, p = 0.02). Teams using the LUCAS had a 22.8% decrease (95% CI [-48.80, 3.24]) in delivery of poor quality chest compressions (Hedge's g = 1.04, t[df 10] = -1.87, p=0.08) and fewer deviations in medication administration (Hedge's g = -1.49, t[df 10] = -1.87, p=0.02) as compared to in the control group (n=6).

Conclusion: In this small pilot study, use of an automated compression device was associated with an increase in team communication focused on diagnosis and improved adherence to ACLS algorithms. While not all outcomes reached statistical significance, the large effect sizes demonstrate practical significance.

607 Predicting Patients at Low Risk of Variceal Bleeding as the Source of Upper Gastrointestinal Hemorrhage

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Background: Upper gastrointestinal bleeding (UGIB) can be life threatening, particularly variceal bleeding. Determining if a patient is at low risk of variceal bleeding, and therefore does not have an indication for octreotide administration, can be difficult. Laboratory evaluations of hepatic dysfunction may predict low risk patients.

Objectives: To determine the negative predictive value and likelihood ratio of normal platelets, INR, and no prior history of variceal bleeding for absence of variceal bleeding in UGIB.

Methods: Retrospective chart review set at a high-volume urban ED of adult patients admitted with UGIB between 1/2008 and 12/2014 who had upper endoscopy performed during hospitalization. Laboratory values including INR, platelet count, and total bilirubin were pulled from the medical record directly. Trained reviewers abstracted the following: whether there was a prior history of variceal or non-variceal bleed, if ascites was noted on examination, and the source of UGIB, coded as variceal or non-variceal. The source was deemed to be variceal if esophageal varices, gastric varices, or portal hypertensive gastropathy were observed to be bleeding during endoscopy. Interobserver agreement was assessed. The following labs were classified as abnormal: INR >1.4; platelets <150,000/μL; total bilirubin > 1.2 mg/dL. Patients taking warfarin were excluded from any analysis that included INR. Data were analyzed descriptively.

Results: 707 patients were identified; 69 (9.8%) had variceal bleeds. Patients with a normal INR had a negative predictive value (NPV) for no variceal bleeding of 95% (95% CI 92.8 to 96.7) and negative likelihood ratio (nLR) of 0.45 (0.34 to 0.61). Patients with normal INR and platelets yielded a NPV of 97.3% (95.2- to 98.6) and NLR of 0.24 (0.14 to-0.41). Patients with normal INR, normal platelets, and no prior history of

	All Patients (n=707)	Variceal Bleed (n=69)	Non-variceal Bleed (n=638)
Age [Avg (95% CI)]	55 (54-56)	53 (50-55)	56 (54-57)
Sex	437 (62%) – Male	38 (55%) – Male	399 (63%) – Male
History of Variceal Bleed	61 (9%) – Yes 485 (69%) – No 161 (23%) – Unknown	24 (35%) – Yes 26 (38%) – No 19 (28%) – Unknown	37 (6%) – Yes 459 (72%) – No 142 (22%) – Unknown
History of Non-variceal Bleed	243 (32%) – Yes 289 (41%) – No 175 (25%) – Unknown	31 (45%) – Yes 15 (22%) – No 23 (33%) – Unknown	212 (33%) – Yes 274 (43%) – No 152 (24%) – Unknown
Ascites on ED or H&P exam	59 (8%) – Yes 648 (92%) – No	18 (26%) – Yes 51 (74%) – No	41 (6%) – Yes 597 (94%) – No
Taking warfarin	44 (6%)	0 (0%)	44 (7%)
INR [Avg (SD)]	1.5 (1.0)	1.7 (0.5)	1.4 (1.1)
Platelets [Avg (SD)]	221 (130)	123 (72)	232 (130)
Total Bilirubin [Avg (SD)]	1.5 (2.9)	3.0 (3.5)	1.3 (2.7)

Table 607: Money.

variceal bleed yielded a NPV for no variceal bleeding of 97.7% (95.8-99.0) and NLR of 0.20 (0.11-0.37). Lack of ascites and normal bilirubin did not further decrease the nLR.

Conclusion: Patients presenting with UGIB with a normal INR, platelets, and no prior history of variceal bleeding are at relatively low risk of variceal bleeding.

608 Do Urine Cultures in the Emergency Department Change Management of Young Women with Symptoms of Uncomplicated Urinary Tract Infection?

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Background: Current guidelines do not recommend the routine use of urinary cultures in the management of uncomplicated urinary tract infection (UTI) in premenopausal, non-pregnant women. Complicating factors include atypical presentation, structural abnormalities or recent recurrent infection/antibiotic use.

Objectives: To determine the number of urine cultures ordered for women who presented to the emergency department (ED) with symptoms of uncomplicated UTI, and whether a culture result impacted subsequent management.

Methods: This was a retrospective chart review of women aged 18-39 presenting to one of two academic EDs with a discharge diagnosis of uncomplicated UTI from Jan-Dec 2014. Patients were excluded if any of the following were documented: pregnancy, fever, immunocompromised state, diabetes mellitus, absence of lower urinary tract symptoms, ED administration of intravenous antibiotics, a previous UTI treated with antibiotics in the last 90 days, two weeks post-partum or post-instrumentation.

Results: Of the 512 charts included in the analysis, 494 (96.5%) patients had a urinalysis, of which 463 (93.7%) had positive leukocyte esterase and 90 (18.2%) had positive nitrites. 370 patients (72.3%) had urine cultures performed, of which 236 (63.8%) were positive. 505 (98.6%) patients received antibiotics (53.9% Macrobid; 22.6% Ciprofloxacin; 15.0% Septra; 6.7% other; 1.8% not documented). 7 (1.9%) cultures grew organisms resistant to the prescribed antibiotic; 2 (0.5%) patients received new prescriptions.

Conclusion: For the majority of young female patients with uncomplicated UTI, urine cultures did not change management. Almost all patients had a positive leukocyte esterase and were treated with antibiotics, yet approximately 40% of the patients tested did not return positive urine cultures, suggesting that better algorithms for the diagnosis of UTI in the ED are required. Unnecessary treatment with antibiotics is expensive, contributes to the development of multidrug resistant organisms, and exposes the patient to the unnecessary risks of possible allergic reactions, drug interactions and side effects.

609 Diagnosing Urolithiasis or Nephrolithiasis via Emergency Ultrasonography and Urinalysis

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Background: Symptoms consistent with ureterolithiasis or nephrolithiasis are a common emergency department presentation. The current gold standard of diagnosis is either a non-enhanced helical computed tomography scan (CT) or intravenous pyelography (IVP). The diagnostic accuracy of emergency physician performed point-of-care ultrasound (EUS) and urinalysis has not been quantitatively described.

Objectives: This is a systematic review to determine the utility of emergency point-of-care ultrasound and urinalysis in diagnosing ureterolithiasis or nephrolithiasis.

Methods: PUBMED and EMBASE databases were searched from 1965 to February 2015 using the following PICO format: patients were adult ED patients greater than 18 years of age suspected of having ureterolithiasis or nephrolithiasis. Interventions were urinalysis (either dipstick or microscopic) for the presence of hematuria and EUS for the detection of hydronephrosis. The comparator was abdominal CT, IVP, or stone passed/surgically removed. Outcome: The operating characteristics of urinalysis and EUS for the detection of radiographically or surgically confirmed kidney stone.

Results: Eight studies were included for EUS with a pooled sensitivity of 80.1% (95% CI 77.5 - 82.5) and specificity of 64.5% (95% CI 61.8 - 67.2). They had a positive likelihood ratio of 2.92 (95% CI 2.12 - 4.03) and a negative likelihood ratio of 0.26 (95% CI 0.19 - 0.36). Three studies were included for dipstick urinalysis with a pooled sensitivity 88.5% (95% CI 83 - 92.8) and specificity of 34.7% (95% CI 27.6 - 42.3). They had a positive likelihood ratio of 1.35 (95% CI 1.20 - 1.53) and a negative likelihood ratio of 0.26 (95% CI 0.08 - 0.85). Ten studies were included for microscopic urinalysis at varying diagnostic thresholds of red blood cells per high powered field, with varying results.

Conclusion: EUS plus urinalysis can satisfactorily rule in or rule out ureterolithiasis obviating the need for CT. EUC can also be utilized to investigate more serious pathology in the differential of such symptoms, such as abdominal aortic aneurysm.

610 Emergency Department Management of Renal Colic: Does Gender Matter?

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Background: Renal colic is a common emergency department (ED) problem. Gender difference in care of various disease processes has been previously identified.

Objectives: We sought to assess gender differences in treatment, imaging and 60-day outcomes.

Methods: This administrative database study and retrospective chart review was conducted in Calgary, AB. We studied all patients seen in Calgary's four EDs who had a discharge diagnosis of renal colic in 2014. Demographics, triage category, pain score, vital signs, medications, imaging, and diagnostics were obtained from the electronic ED record. Surgical interventions, ED and hospital visits within 60-days were collated from all four regional hospitals. Research assistants reviewed imaging reports to determine stone characteristics. Our primary outcome, reflecting adequacy of ED care, was the proportion of patients with an unscheduled ED visit within 7 days. Secondary outcomes included ED wait times, opioid administration, complex imaging use, and surgical intervention.

Results: In 2014, 1111 women (35.8%) and 1993 men (64.2%) were treated for renal colic. Mean age was 45.9 and 49.4 years respectively. Median (IQR) pain score was 8.0 (6.0-9.0) in both groups. There were no differences in EMS arrival rates, triage acuity, or prior renal colic and intervention rates. Median (IQR) stone size was equal in women and men: 3.0 mm (2.0-5.0) for kidney stones and 4.0mm (3.0-6.0) for ureteral stones. The genders were equally likely to have ureteral stones over 5 mm (27.4% vs. 27.5%), but women were less likely to have hydronephrosis (67.6% vs. 73.5%) or perinephric stranding (44.8% vs. 56.4%). Median time to MD was 75 min for women and 74 min for men. Similar proportions received IV opioids (68.9% vs. 72.0%; difference=3.1%; 95% CI, -0.4 to 6.5) and IV ketorolac (60.8% vs. 62.8%). Women were less likely to have a CT (61.9% vs. 73.2%; difference=11.3%; 95% CI, 7.8-14.8) but more likely to have an US (21.7% vs. 10.2%; difference=11.5%; 95% CI, 8.6-14.3). There were no significant differences in admission rates (43.3% vs. 41.1%) or index intervention rates (31.3% vs. 28.8%). Unplanned ED revisit rates were similar at 7-days (17.9% vs. 19.0%; difference=1.1%; 95% CI, -2.8 to 4.9) although women were less likely to be admitted (6.5% vs. 9.8%).

Conclusion: We found no evidence of gender-based differences in patient and stone characteristics, nor in ED care or outcomes.

611 A Comparison of Urolithiasis in the Presence and Absence of Hematuria in the Emergency Department

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Background: Urolithiasis is an extremely common medical condition that results in over 1.2 million United States emergency department (ED) visits each year. Urinalysis is an important screening test for patients presenting with flank pain, because hematuria is 84% sensitive in the detection of ureteral stones. It has not been studied whether there is any difference in characteristics of ureteral stones in patients who have hematuria and those who do not.

Objectives: We ought to compare the mean size of ureteral stones and the incidence of hydronephrosis in patients with and without microscopic hematuria.

Methods: We conducted a retrospective chart review of patient visits to a single tertiary academic medical center ED between the dates of July 1, 2008 and August 1, 2013. We reviewed medical records for all patients who had a non-contrast CT abdomen/pelvis and microscopic urinalysis performed in the ED. We excluded patients with a ureteral stent or nephrostomy tube or those without ureteral calculi on CT. We calculated average ureteral calculus size and the proportion and severity of hydronephrosis in patients with (>4 red blood cells per high power field) or without (= or <4 red blood cells per high power field) microscopic hematuria on urinalysis.

Results: A total of 413 patient visits met inclusion criteria out of a total of 2,370 medical records. Among these 322 (78%) had microscopic hematuria, based on our a priori definition. The average size of ureteral calculi for patient visits without microscopic hematuria was 5.3 mm, similar to that seen in patient visits with microscopic hematuria, 4.8 mm ($p = 0.21$). The proportion of patient visits with the presence of moderate-to-severe hydronephrosis was higher among those without microscopic hematuria (37%) than among those with microscopic hematuria (26%) ($p = 0.03$).

Conclusion: Patients without hematuria tended to have a higher incidence of moderate-to-severe hydronephrosis. Hematuria may be less likely in the setting of complete obstruction because bloody urine may not pass the point of obstruction.

612 Proton Pump Inhibitors (PPIs) are Associated with a Reduced Risk for Trichomonas Vaginalis (TV) Infection

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Background: PPIs are benzimidazole derivatives, structurally similar to the antiprotozoal drugs albendazole and mebendazole. PPIs have been shown in cell culture to kill TV, *Giardia lamblia*, and *Entamoeba histolytica* at lower half maximal inhibitory concentration (IC_{50}) values than metronidazole (Flagyl), the drug commonly used to treat those infections. There have been no investigations to determine if there is a clinical association between PPI use and TV infection.

Objectives: The objective of the study was to determine if PPI use is associated with lower TV infection.

Methods: A chart review of the medical records from two hospital systems of women aged 18-40 years old that received testing for TV, *Neisseria gonorrhea* (GC), and *Chlamydia trachomatis* (CT) in the ED between 2010-2014. PPI use, histamine 2 receptor antagonist (H2RA) use, or neither was determined from the medication list at the time of testing.

Results: 118,451 charts met inclusion criteria and were reviewed. PPI use, compared with neither PPI/H2RA use, was associated with a reduced risk for TV infection (OR: 0.75, 95% CI: 0.65-0.86, $p < 0.0001$). PPI use, compared with those taking a H2RA, was associated with a reduced risk for infection with TV (OR: 0.37, 95% CI: 0.30-0.45, $p < 0.0001$). When controlling for GC/CT co-infection, we still found that PPI use, compared with neither PPI/H2RA use, was associated with a reduced risk of TV infection (OR: 0.64, 95% CI:0.40-1.01, $p = 0.05$).

Conclusion: PPIs are associated with a reduced risk for *T. vaginalis* infection in the ED. This association holds even when controlling for co-infection with GC/CT and with H2RA use. Our data are congruent with previous TV cell culture data and suggests that it is possible that PPIs may have anti-trichomonal activity in humans.

613 Using a Non-Invasive Method to Stage Liver Disease in Chronic HCV-Infected ED Patients

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Background: High HCV seroprevalence has been observed in urban EDs across the United States. However, the magnitude of advanced liver fibrosis (the hallmark of HCV progression) remains unknown in this population as invasive liver biopsy is the traditional 'gold standard' for staging. FIB-4, a non-invasive serum fibrosis marker index (which includes age, ALT, AST, and platelet count) and can be easily applied in EDs, has recently been validated as an alternative reliable index to stage liver disease for those with HCV.

Objectives: To determine the prevalence of advanced liver fibrosis using the non-invasive FIB-4 index among ED patients with chronic HCV infection in an urban academic ED.

Methods: ED patients who were HCV infected ED patients were identified via review of the electronic medical record (EMR) as part of an ongoing (8 months to date) ED HCV linkage to care quality improvement program. FIB-4 scores were calculated using the following formula: [age (years) × AST (U/L)] / [platelet count (10^9/L) × (ALT (U/L))$^{1/2}$]; a FIB-4 of > 3.25 equates with advanced fibrosis.

Results: 157 ED patients with anti-HCV antibody were identified; 115 had confirmed chronic HCV infection, of which 113 had sufficient data to calculate a FIB-4 score. Median FIB-4 value, 2.26 (IQR: 1.41 to 4.68); mean, 4.62 (SD: 12.27); 38 (34%) has scores >3.25, i.e. advanced fibrosis. Those with advanced fibrosis, versus those without, were more likely to be older (mean age: 57.2±7.5 years versus 52.6±10.0 years, $p=0.013$). There was no statistical difference in advanced fibrosis by gender, race or HIV status. 34/38 (89%) patients with advanced fibrosis and 72/75 (96%) without advanced fibrosis agreed to be linked to HCV specialty care. Four (3.5%) of the 113 patients evaluated patients deceased, all were related to liver diseases.

Conclusion: Over one-third of ED patients with HCV have advanced liver fibrosis. The ability to use non-invasive methods to identify this subgroup should be considered as a factor in prioritization in linkage to care services.

614 The Emergency Department Dysphagia Screen is Associated with Lower Rates of Pneumonia in Acute Ischemic Stroke Patients

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Background: Dysphagia is a common problem in acute ischemic stroke (AIS) patients predisposing them to pneumonia and leading to worse outcomes. The Joint Commission mandated that dysphagia screening be performed at hospital presentation, which for most patients with AIS, is the Emergency Department (ED). No evidence exists to demonstrate whether the use of an ED dysphagia screen is associated with lower rates of pneumonia.

Objectives: To assess the hypothesis that the use of an ED dysphagia screen would not be associated with lower rates of pneumonia in AIS patients.

Methods: We performed a pre-post cohort study evaluating the rates of pneumonia in AIS patients presenting to our ED. Our pre group were AIS patients presenting from 2005-2009 and our post group from 2011-2015. The presence of pneumonia was pre-defined as new pulmonary infiltrate treated with antibiotics. We collected demographic and clinical data including rates of dysphagia and stroke severity. Data are presented as frequencies and medians with interquartile ranges (IQR) where appropriate. Rates of pneumonia were compared using the t-test.

Results: We evaluated 419 pre screen and 1022 post screen AIS patients. Both groups were 50% female. The use of thrombolytics in the pre group was 10% and post group was 11%. The median ages and ED NIHSS scores for the pre and post population were 63 years (IQR 53-73), 6 (IQR 3-10) and 64 years (IQR 56-76), 4 (IQR 2-8). Rates of dysphagia during hospitalization were 20% and 31% for the pre-post groups respectively. Rates of pneumonia for the pre-post groups were 13.8% and 8.0% respectively which was significantly different P=0.0007.

Conclusion: The use of an ED dysphagia screen is associated with a lower rate of pneumonia in AIS patients. Confounding factors may have influenced the lower rate of pneumonia, such as the lower NIHSS in the post group. The rates of diagnosed dysphagia were higher in the post group suggesting ED screening may heighten awareness resulting in increased diagnoses of dysphagia. Given the rates of dysphagia and pneumonia early screening of AIS patients in the ED seems prudent.

615 Analysis of Time Between Prehospital Vital Signs

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Background: Current EMS teaching advises prehospital providers to obtain vital signs every five minutes for unstable patients and every 15 minutes for stable patients in order to accurately monitor changes in hemodynamics. No data currently exists to support the use of these time intervals or whether vital signs change significantly over the transport time interval.

Objectives: To determine time to change in repeat vital signs during EMS transport.

Methods: We performed a retrospective chart review of consecutive prehospital patient care records from July 2014-June 2015 representing 38 EMS agencies. Exclusion criteria include a reported transport time >2 hours, inaccurate vital sign times, calls documented as standby, no patient found, cancelled or turned over to mutual aid. A significant change in vital signs was determined a priori as a ≥10% change (either increase or decrease) in heart rate, respiratory rate or systolic blood pressure. Kaplan-Meier survival estimates were used to examine time until event (vital sign change).

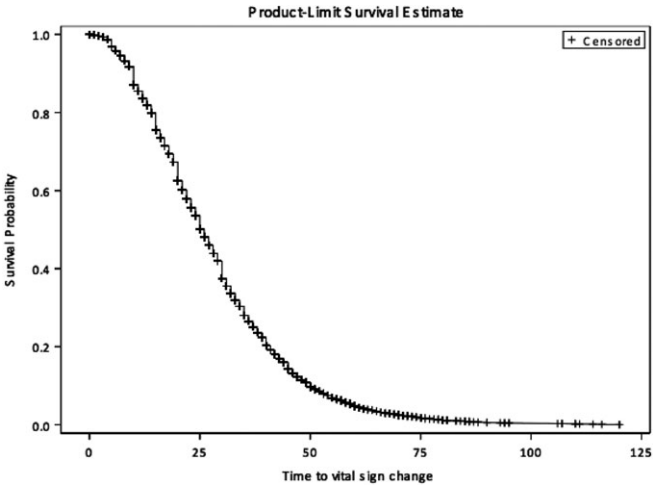

Figure 615 – Chambers

Results: Of the 89,712 charts reviewed, 56,331 (63.4%) met inclusion criteria with more than 2 sets of valid vital signs available for analysis. The majority of responses were medical (79.7%) vs. traumatic (21.1%) with a median transport time of 38 minutes (IQR 29 - 50). 58.9% of patients had a significant change in vital signs during transport. Based on survival curve analysis, 3.1% of patients had change within 5 minutes and 24.5% had change within 15 minutes.

Conclusion: Many patients transported by EMS have significant changes in vital signs within the currently taught time ranges. Further analysis is needed to determine at what frequency specific patients require prehospital vital sign monitoring.

616 Accuracy of Medical History and Medications Documented by Emergency Medical Services

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Background: A crucial aspect of emergency medical services (EMS) care is documenting accurate patient information, particularly medications and medical history. If accurate, EMS data can assist healthcare providers in caring for patients. However, no study has examined the accuracy of medical histories and medications collected by EMS.

Objectives: Describe the accuracy of EMS-recorded medical history and medications, as compared to a comprehensive "gold standard" compiled from other sources.

Methods: We conducted a cross-sectional survey study of a convenience sample of older adults (age ≥65) transported by EMS to an emergency department (ED). A survey was developed and administered, which asked for demographic and clinical information. For each patient, current medications and medical conditions were collected from four sources: patient and/or proxy, patient's primary care physician (PCP), hospital medical record, and EMS prehospital care report. A "gold standard" was created by combining the PCP and hospital medical record lists. We compared the EMS medical history and medication lists to the gold standard lists.

Results: We enrolled 200 subjects; 106 had complete data for analysis. EMS documented fewer medications (median of 5 vs. 12) and medical conditions (3 vs. 9), compared to the gold standard. Only 20% of subjects and/or proxies were able to provide names of medications

and 63% were able to provide names of medical conditions. EMS documented a median of 51% (range: 0-350%) of the gold standard medications and 41% (range: 0-400%) of the gold standard medical conditions. Patients and/or proxies reported a median of 0% (range: 0-120%) of the gold standard medications and 14% (range: 0-300%) of the gold standard medical conditions.

Conclusion: EMS documented approximately half of the number of medications and medical conditions that were recorded in the PCP and hospital medical records. There were instances of EMS collecting substantially less and substantially more data than is available from other sources. Patients and their proxies were able to provide little information about their medications and medical conditions. These findings suggest that healthcare providers cannot rely on a single source of patient information and may lack critical information unless they have access to consolidated electronic medical records.

617 Body-Worn Cameras Improve EMS Documentation Accuracy

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Background: Body-Worn Cameras (BWCs) are common in society and allow review of events of importance to the wearer. This technology is currently evolving and is not widely used by EMS providers. EMS documentation usually occurs from memory after event completion. Memory is a re-constructional process influenced by factors that can introduce error.

Objectives: The objective of this study was to evaluate the effect on documentation accuracy from a a simulated patient encounter when a BWC is used to augment the process.

Methods: This was a prospective, observational study, using a convenience sample of urban paramedics (PMs), conducted in a simulation lab. The PMs were provided with a BWC and with all of their standard work equipment. They were introduced to a simulated call of "One Down" (from heroin abuse). Moulages role players provided standardized cues. The simulation had multiple items of concern in it (e.g., weapons present, illicit substances in view, unattended minors, etc.) The simulation led to following the local EMS system's "Narcotic Overdose" protocol. Several stressful distractions occurred during the simulation (e.g., dealing with a distraught family member, finding a weapon, patient offering a bribe to the PM to be released, etc.) After the scenario, PM documentation occurred from memory on an electronic template. Upon initial template completion, PMs viewed their BWC recording and were allowed to make changes tabulated with a tracking function. Changes were categorized by a priori criteria as minor, moderate or major.

Results: Ten PMs were studied with an average age of 33.3 years (range 22-42), 8 males and 2 females. The average years of PM experience were 7.7 (range 2 months to 20 years). There were a total of 71 documentation changes (7 minor, 51 moderate, 13 major) made by the PMs after video review. Linear regression (ANCOVA) indicated the number of changes made indirectly correlated with PM years of experience (coefficient 8.27, 4.22-12.3, 95% CI, p=0.002) but all PMs had some changes.

Conclusion: Current EMS documentation practices demonstrate inaccurate recall regardless of years of experience. BWC use by EMS shows promise and appears to improve documentation accuracy in this pilot study.

618 Pre-Hospital Pediatric Care in New York City 2006-2012: Interventions and Medications

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Background: Children represent an important and potentially challenging population encountered by emergency medical technicians (EMTs) and paramedics in the pre-hospital setting. Limited training, infrequent exposure to seriously injured or ill children, and differences in specialized equipment and medication dosing all contribute to the challenge of caring for sick and injured children.

Objectives: This study aims to characterize the types of interventions performed and medications administered to children by EMS providers in a large urban environment.

Methods: We retrospectively reviewed FDNY data from the years 2006-2012 identifying children aged 0-18 years for whom 911 was contacted and FDNY EMS responded. From this data set we extracted information regarding the types of interventions performed and medications administered

Results: Of the 534,403 children encountered in the 6-year period, EMS providers performed nearly 560,000 procedures. Basic trauma life support interventions were most common. Nearly 19,500 children (3.6% of patients) were placed in cervical collars and there were 18,800 (3.5%) immobilizations on a long board. Intravenous access was obtained 3,849 times (0.7%). CPR was performed 971 times and Automatic External Defibrillation was attempted one hundred and fifty (150) times, delivering 243 defibrillation shocks. Endotracheal intubation was performed in 431 children, though capnography was only documented 246 times. 2,761 children received mechanical ventilation with a bag-valve mask (0.5%). 1,376 neonates were delivered by EMS providers (0.3%). Medications were administered more than 46,000 times in the study period, with albuterol the most commonly delivered, 29,806 times (5.5%). Epinephrine 1:1,000 was administered 1,145 times (0.2%). Medications used in the setting of status epilepticus, tachyarrhythmias and cardiac arrest were infrequently administered, each in less than 0.1% of patients.

Conclusion: Trauma-related procedures and the management of common respiratory problems should remain an important part of pediatric EMS education. That few opportunities arise to perform endotracheal intubation, CPR or administer medications to critically ill or injured children challenges EMS educators to prepare providers for these high acuity, low frequency events.

619 Out-of-Hospital Intubation Success Rates by EMS Providers Using a Low-Cost Disposable Video Laryngoscopy System

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Background: Video-assisted laryngoscopy (VAL) has revolutionized management of the difficult airway in the emergency department (ED). The most significant barrier to prehospital implementation has been cost, with individual devices costing in upwards of $10,000. The VividTrac video-assisted laryngoscopy (VIVID) device provides a disposable, low cost ($80) option for emergency medical systems (EMS).

Objectives: Our objective was to report EMS provider out-of-hospital intubation success rates using the VIVID device.

Methods: Video laryngoscopy became the initial intubation method of choice for Norfolk Fire Rescue (annual call vol. 31,000) beginning October, 2014. The VIVID device was stocked on thirteen medic units within the city of Norfolk, VA (pop. 246,139). EMT-Paramedic and EMT-Intermediate providers were trained and practiced its use in the simulated environment prior to use in the out-of-hospital setting. Per protocol, providers could alternatively use direct laryngoscopy (DL) after a failed VIVID intubation. As part of standard quality assurance metrics, success rates with both VIVID and DL were tracked.

Results: Between October, 2014 and October, 2015, 226 patients were identified in the out-of-hospital setting as requiring intubation. Video laryngoscopy assisted intubation using the VIVID device was attempted 223 times. One hundred eleven patients (50%) were successfully intubated using the VIVID device. DL was attempted 89 times during the same time period with 44 successful intubations (51%). Success rates comparing VIVID versus DL were not statistically significant (P= .90; 95% CI [-0.13, 0.12]).

Conclusion: Out-of-hospital intubation success rates using the VIVID device were not superior to traditional direct laryngoscopy.

620 Statewide Prehospital Airway Quality (SPArQ) Program Assessing Cardiac Arrest Following Prehospital Rapid Sequence Intubation in North Carolina

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Background: Rapid sequence intubation (RSI) is a specialized skill that remains a controversial procedure in the prehospital environment. Despite known complications of RSI, the relationship between prehospital RSI (pRSI) and cardiac arrest has not been extensively studied.

Objectives: The objective of this study was to quantify the incidence of cardiac arrest following pRSI and identify factors associated with cardiac arrest following pRSI.

Methods: Study data were obtained from a manual extraction of North Carolina prehospital patient care records and from Airway Evaluation Forms that are required to be completed for all prehospital medication assisted intubations in the state. All patients who received pRSI from March 2014 to June 2015 were included. The independent variables analyzed included patient's gender, region of North Carolina where pRSI call took place, intubation due to trauma, EMS provider reported endotracheal tube properly placed, at least two paramedics present, sedative and paralytic used for pRSI was not reported on PCR, end-tidal CO2 <20 mmHG, more than three intubation attempts, and video device used. Multivariable logistic regression modeling was performed to examine the outcome of cardiac arrest following pRSI (yes/no).

Results: During the study period, there were 1,098 prehospital events in NC where pRSI was performed. Of those, 45 (4.1%) cardiac arrests occurred following pRSI. Simple logistic regression revealed statistically significant relationships ($p<0.05$) between the patient's age, the EMS provider's report of uncertain placement or misplaced endotracheal tube, and a capnography reading of <20 mmHg following pRSI. In the adjusted logistic regression model, both a capnography reading of <20 mmHg (OR: 16.24, 95%CI: 6.59-40.01, $p<0.001$) and the patient's age (OR: 1.02, 95%CI: 1.00-1.04, $p=0.016$) remained significant after adjustment. The variable identifying an EMS provider's report of uncertain placement or misplaced endotracheal tube remained in the final model due to confounding.

Conclusion: This study emphasizes the importance of proper endotracheal tube placement during pRSI, confirmed by end-tidal CO2. This study, to our knowledge, is the first to identify a significant relationship between capnography reading and cardiac arrest following pRSI.

621 Should We Be Intubating Obese Patients in the Pre-Hospital Setting?

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Background: Prehospital intubation, especially for patients with potentially difficult airways, is controversial. Obesity is considered a risk factor for an airway that is difficult to secure. Research suggests that patients with failed intubation or multiple attempts have worse outcomes.

Objectives: We sought to determine if the prehospital intubation success rates were similar for obese patients compared to other patients. If a difference exists, we sought to quantify the difference to assist medical directors in establishing guidelines for the airway management of obese patients.

Methods: Design: Retrospective Cohort. Setting: A suburban EMS system. Subjects: All patients in which intubation was attempted over a 4.5-year period. Protocol: The prehospital medical records of all patients requiring intubation over a 4.5-year period were reviewed. Patients 125kg and over were classified as obese. We compared overall intubation success rates and successful first pass intubation rates between obese patients and those under 125kg. Percentage rates, percent differences and 95% confidence intervals (CI) were calculated.

Results: Out of 1969 total intubations, 138 patients were 125kg and over and 1739 patients under 125kg. 92 patients were excluded because weights were missing. For patients 125kg and over, overall intubation success was 81% (CI: 75-88), and for those under 125kg was 89% (CI: 88-90); Difference = 8% (CI: 3-13). The percent of patients 125kg and above intubated on the first attempt was 64% (CI 56-72) and for those under 125kg was 82% (CI: 80-84); Difference = 18% (CI: 11-25).

Conclusion: The rates of successful intubation and successful first pass intubation were significantly lower those for patients 125kg and over. Medical directors may want to establish guidelines for when alternatives to intubation should be considered in obese patients.

622 Emergency Department Patient Perception of Stroke: A Comparison of Elderly and Nonelderly Knowledge of Stroke

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Background: Stroke is one of the top ten leading causes of disability in the United States. Much of the disability associated with stroke can be prevented by adequate treatment with t-PA within three hours of initial stroke symptoms but only a small percentage of patients are eligible to receive therapy, largely due to a delayed presentation for care.

Objectives: The goal of this project is to gain a better understanding of the factors potentially influencing a patient's decision to pursue timely care for acute stroke symptoms.

Methods: We conducted a prospective, multi-center cross sectional survey of English speaking patients presenting to two EDs with a combined census of 70,000. One hospital is an urban, academic teaching hospital (Level 1 trauma center) with an annual census of approximately 42,000 visits. The other hospital is a suburban community hospital with an annual census of approximately 28,000 visits. Participants were presented with 6 symptoms of stroke and three distractors. Additional questions include: 1) demographic data 2) past and current medical conditions. Informed consent and data collection was, and continues to be, collected by trained Research Associates. Means, frequencies and Chi squared testing were used to describe participants.

Results: 241 surveys have been completed. When provided a list of typical stroke symptoms, the percentages of participants identifying dizziness, severe headache, problems with vision, slurred speech, weakness and numbness as a stroke symptom were 82%, 79%, 80%, 93%, 97% and 94% respectively. Elderly and nonelderly patients were compared in their knowledge of stroke, and were found to have no significant difference in the recognition of any of the aforementioned stroke symptoms. Headache approached significance with 94% of elderly vs. 78% of nonelderly ($P> 0.133$) patients recognizing this stoke symptom. In addition, posterior circulation symptoms (headache, dizziness and problems with vision) were recognized less by both elderly and nonelderly patient than anterior stroke symptoms.

Conclusion: A majority of patients do recognize common stroke symptoms and there is no difference between the elderly and non-elderly. In addition, the general population less frequently identifies posterior circulation symptoms.

623 Peer Mentors are Non-Inferior to Attendings in Teaching Basic Ultrasound Guided IV Access

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Background: Medical students in the United States often utilize student-led peer-mentor systems, such as interest groups, to supplement classroom education and develop procedural skills. Due to its interactive nature, ultrasound lends itself well to a peer-mentor approach to education.

Objectives: To demonstrate the noninferiority of peer-mentors versus attending physicians in teaching ultrasound (US) guided peripheral IV (PIV) insertion to second year pre-clinical physician assistant students (PAS).

Methods: Forty-two second year PAS with no prior experience with ultrasound were randomized into two groups: Attending-Led Education (ALE) and Student-Led Education (SLE). Prior to training, study participants were evaluated using a 15 question PIV/US knowledge-based exam and asked to rate their comfort interpreting and obtaining US images using a scale of 1 (no comfort) to 10 (expert-level comfort). Both SLE and ALE groups received an identical 15-minute PowerPoint presentation and 1 hour of hands-on didactics under the instruction of either students or attendings. Participants then completed a video recorded hands-on skills assessment and were scored using a 6-point scale. Students were given the same 15 question PIV/US knowledge-based exam after training and video assessment.

Results: Both attending and medical student taught groups showed improvement in comfort interpreting US images, comfort acquiring US images, and content knowledge assessments using a paired t-test ($p < 0.001$). When compared against each other, there is no significant difference seen in any of the above categories using an unpaired t-test ($p < 0.05$). The video skills assessment reveals no significant differences in total score: ALE 4.5 ± 1.2 vs. SLE 4.2 ± 1.1 ($p = 0.46$).

Conclusion: Interprofessional peer-mentor student teachers are non-inferior to attendings in communicating basic knowledge of ultrasound and demonstrating image acquisition and procedural skills to novice health professions students. Both groups showed marked improvement in comfort interpreting US images, comfort acquiring US images, and content knowledge while no discernable difference was found in overall technical ability as recorded during the video assessment.

624 Predictors of Chief Resident Appointment or the Need for Remediation of Emergency Medicine Residents

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Background: Residency directors are entrusted with the duty to choose medical students who they feel will become successful residents. In our previous study we determined which pre-residency application factors were associated with success in residency. (1) 1. *Bhat, et.al. Predictors of a top performer during emergency medicine residency. Journal of Emergency Medicine 2015 Oct;49(4) 505-12.*

Objectives: The objective of this study is to identify which application variables predict chief resident appointment and those that are associated with the need for remediation during residency.

Methods: We performed a retrospective cohort study using an existing database from graduated classes of nine residency programs. For each graduate, pre-specified predictor variables (Table 1) were collected. The outcome variables of interest were chief resident appointment and need for remediation.

Results: Data from 277 residents was analyzed. Comparison between chiefs and non-chiefs showed a significantly higher proportion of chiefs who were awarded AOA designation (18.6% vs 9.1%, P=0.048). Chiefs also obtained higher mean scores on the USMLE step 2 CK exam, all categorical measures on the EM Standardized Letter of Recommendation (SLOR) and higher scores in surgery, internal medicine, pediatrics and family medicine clerkships. Compared with residents not requiring remediation, residents requiring remediation had significantly lower USMLE step 1 (214 vs 220, p=0.0153) and 2 CK (219 vs 230, p =0.00106) scores, lived further from their permanent home mailing address and received a greater number of "other awards" in their undergraduate years.

Conclusion: Many data points reviewed by program directors have a correlation with becoming chief resident and some with those requiring remediation. While pre-existing data might help predict chief resident appointment, several variables have also been identified that may help identify residents at risk for requiring remediation during residency.

Predictors Evaluated	Notes
Core Third Year Clerkship Grade	0 = Fail, 1 = Pass, 2 = High Pass, 3 = Honors
Home/Away EM Clerkship Grade	0 = Fail, 1 = Pass, 2 = High Pass, 3 = Honors
Ratings from MSPE	Overall rank by quintile
USMLE Step 1 & Step 2 Clinical Knowledge (CK) Scores	Raw score on each exam
Standard Letter of Recommendation (SLOR)	Work Ethic, Global Assessment and Competitiveness scores by Program leadership (PL) and Other SLORs (non PL). Ranked as Good, Very Good, Excellent, and Outstanding.
Interview Score	stratified into top, middle, bottom tier
NRMP Rank Order List Rank	stratified into top, middle, bottom tier
Alpha Omega Alpha (AOA) membership	yes/no
Gold Humanism award	yes/no
Other awards	yes/no
Rank of Medical school attended (Research and Primary Care)	1 = Unranked, 2 = Not published, 3 = Lower third, 4 – middle third, 5 – top third
Degree earned	DO vs MD
International Graduate	Yes/No
Extracurricular activities	yes/no if significant extracurricular experience (examples include star athlete, eagle scout, military service, officer in medical school or national society)
Prior EM experience	yes/no if over 1 year experience as an EMT, EM patient care technician, medical scribe in the ED, or ED nurse
Prior work experience	yes/no if over 1 year any work experience
Number of presentations	including posters, oral presentations at national meetings
Number of publications	including only full manuscripts in peer review journals, text book chapters, review articles
Distance from permanent home address to residency program	in-state, regional, cross country, or international

Table 1. List of all predictor variables evaluated during the study

Figure 624 – Visconti

625 Emergency Medicine Interest Groups: Are They Important for Residency Selection?

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Background: Medical students can be exposed during pre-clinical years to medical specialties through Interest Groups (IG). There has been limited data that has evaluated the effectiveness of these IGs in attracting students to different specialties.

Objectives: Our aim was to better determine the efficacy of the interest group experience in choosing a medical specialty.

Methods: A convenience sample of graduating medical students were anonymously surveyed during three consecutive years from 2013-2015 at the Brody School of Medicine. Using chi square analysis it was determined whether belonging to an interest group correlated with matching into that specialty.

Results: A total of 229 of 230 graduating students (99.6%) were surveyed over a 3-year period. An equal number of students (40%) describe interest groups having some influence on specialty choice as having no influence. Despite this, 94% of students recommended that first year students should join an IG. There was little difference found in self-reported importance of "hands-on" activities, lecturers, opportunity to meet faculty members, or shadowing opportunities. 25% (57) of the students reported being a member of the Emergency Medicine (EM) IG, of those 26% (15) matched into an EM residency. All but one of the students who matched into EM had been a member of the EMIG. Across all specialties, 71% (133 students) of students identified with being in an IG for the same specialty in which they matched. There was a strong correlation between involvement in a specialty specific interest group in the preclinical years and matching in that specialty for EM, FM, Peds, OB/GYN, and Gen Surgery.

Conclusion: Senior medical students overwhelmingly recommended joining an interest group to pre-clinical medical students, but were less enthusiastic about the usefulness of these groups. For most specialties there was a strong correlation of membership in an interest group and matching into that specialty. IG may be useful in recruiting preclinical students with an interest in a specialty, but may not be useful in attracting students who have not already identified an interest in that field.

Table 1: Does other medical specialties considered affect decision timing on EM?

	Decided on EM during_M3		Decided on EM during M4 or still deciding	
VARIABLES	Relative Risk Ratio	95% Confidence Interval	Relative Risk Ratio	95% Confidence Interval
Interest in Anesthesia Rank (1=high, 22=none)	0.98 (0.01)	0.95 – 1.01	0.98 (0.01)	0.96 – 1.01
Interest in Family Medicine Rank (1=high, 22=none)	0.96* (0.02)	0.93 - 0.99	0.95** (0.02)	0.92 - 0.98
Interest in Internal Medicine Rank (1=high, 22=none)	0.96*** (0.01)	0.93 - 0.98	0.94*** (0.01)	0.92 - 0.97
Interest in Orthopedic Surgery Rank (1=high, 22=none)	0.98 (0.02)	0.95 - 1.02	0.99 (0.02)	0.96 - 1.03
Interest in Pediatrics Rank (1=high, 22=none)	0.97* (0.02)	0.93 - 0.99	0.97 (0.02)	0.94 - 1.00
Interest in General Surgery Rank (1=high, 22=none)	0.96** (0.01)	0.93 - 0.99	0.96*** (0.01)	0.93 - 0.98
Interest in Radiology Rank (1=high, 22=none)	0.98 (0.03)	0.92 - 1.05	0.95 (0.03)	0.89 - 1.01

*Outcome Comparison is Deciding before M3; SE in parentheses; *** p<0.001, ** p<0.01, *p<0.05; Area under ROC .71*

Table 626: Ray.

626 How Does the Consideration of Other Possible Medical Specialties and the Reason to Choose Emergency Medicine Affect the Timing of Specialty Selection?

John Ray[1], Laura R. Hopson[2], William Peterson[2], Sally Santen[2], Sorabh Khandelwal[3], Fiona E. Gallahue[4], Melissa White[5], and John C. Burkhardt[2]

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Background: Medical students choose Emergency Medicine (EM) after consideration of multiple options based on their own needs and desires for their future. The literature on medical specialty selection has generally focused on factors such as income and lifestyle.

Objectives: The objective of this study is to consider how lifestyle factors may have differential effects and how the consideration of alternative specialties informs a student's specialty selection process.

Methods: An IRB approved cross-sectional survey study of EM bound 4th year medical students was performed. The 8-question survey explored when and why students choose EM as their specialty. The survey was distributed via e-mail the first week of March 2015 to all medical students who applied to an EM residency at 4 programs representing different geographical regions. Descriptive analysis and creation of multinomial logistic regressions were performed.

Results: 793/1372 (58%) responded overall to the survey. Of students who decided on EM, 110 (13.9%) chose prior to Year 3, 399 (50.4%) chose during Year 3, and 282 (35.7%) decided in Year 4 or later. The top 5 most common specialties considered as either a student's first or second alternative were Internal Medicine, General Surgery, Anesthesia, Family Medicine, and Pediatrics. As interest in an alternative specialty decreased the likelihood of earlier selection of EM increased: Internal Medicine (p<.001), General Surgery (p<.01), Family Medicine (p<.05), and Pediatrics (p<.05) (Table 1). Increased importance of Finical Compensation and Opportunity to Teach were both associated with earlier selection of EM (Table 2).

Conclusion: Medical students who eventually choose EM tend to consider the same alternative specialties. The relative rank given in consideration to a specialty as an alternative was associated with the timing of a medical student selecting EM. Increased importance of financial compensation and desire to teach were associated with earlier decisions to enter EM.

Table 2: Do the reasons a student chooses EM affect the timing of the decision?

	Decided on EM during M3		Decided on EM during M4 or still deciding	
VARIABLES	Relative Risk Ratio	95% Confidence Interval	Relative Risk Ratio	95% Confidence Interval
Importance of Financial Compensation Rank (1=high interest, 12=Not important)	1.06 (0.03)	1.00 - 1.12	1.08* (0.03)	1.01 - 1.15
Importance of Demands on Family Rank (1=high, 12=Not important)	0.95 (0.03)	0.90 - 1.01	0.99 (0.03)	0.93 - 1.05
Importance of Opportunity to Teach Rank (1=high, 12=Not important)	1.05 (0.03)	0.99 - 1.11	1.07* (0.03)	1.01 - 1.13
Importance of Patient Population Served Rank (1=high, 12=Not important)	0.97 (0.03)	0.93 - 1.03	0.98 (0.03)	0.93 - 1.04

*Outcome Comparison is Deciding before M3; SE in parentheses; *** p<0.001, ** p<0.01, *p<0.05; Area under ROC .60*

Table 626: Ray.

627 Soft-Cured Cadavers Versus Fresh Frozen for Procedures

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Background: In an era of patient safety it is imperative that students be taught invasive procedure techniques prior to performance on live patients. Task trainers have been utilized to accomplish this type of training however resident trainees complain the anatomy is not realistic and it does not instill confidence within the student. Fresh cadavers have been utilized to give students confidence in performance of procedures as there is real anatomy, which the student observes during the performance of the procedure.

Objectives: To determine if a new type of cadaver which is soft cured (SCC) be utilized over multiple training sessions and be comparable in task training to a fresh frozen cadaver (FFC)

Methods: A workshop was developed to train course participants in medical procedures using trainer manikins and cadavers. Two 45-minute lectures were presented followed by two two-hour blocks in which participants performed procedures on trainer manikins & on cadavers. Both FFC (un-embalmed) & soft embalmed cadavers were utilized. Medical procedures included: intubation & endotracheal tube (ETT) placement, tibial/ humeral IO line placement, thoracostomy & chest tube placement, cricothyrotomy, pericardiocentesis, needle decompression, central line placement, & thoracotomy with inspection of chest contents (heart, lungs, great vessels, etc). Participants were asked to complete a questionnaire on a 5-point Likert scale (1-poor, 5-superior).

Results: 47 participants have attended this workshop. Overall course evaluation was 4.85. Trainer manikin section was 4.67. Participants gave a superior response to the cadaveric workshop (4.96). FFCs were favored over soft cured for a majority of medical procedures performed.

Conclusion: The cadaveric portion of the workshop received the highest possible evaluation scores. Participants commented on the educational value of training with cadaveric tissue & the opportunity to visualize internal anatomical structures. FFC preference over soft cured was likely a result of presence of blood & realistic skin/tissue textures. Soft cured provided a more difficult airway for intubation training, allowing course participants to implement airway scoring systems & difficult airway identification techniques.

628 Low-Cost, Open Source Ultrasound Simulator Enhances Resident Ultrasound Education

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Background: Commercially available high-fidelity ultrasound simulators are expensive and can be cost-prohibitive in many learning environments. Several studies have investigated whether high-fidelity simulation is more effective than low-fidelity simulation, and have failed to convincingly demonstrate a benefit.

Objectives: We theorized that a low-cost, low-fidelity ultrasound simulator could be effectively integrated into simulated patient cases to improve the image interpretation and clinical application skills of Emergency Medicine residents.

Methods: PGY-1 Emergency Medicine residents attended a lecture on the RUSH (Rapid Ultrasound for Shock and Hypotension) exam. They then completed online surveys assessing their global familiarity with point of care ultrasound and their comfort with using point of care ultrasound in a hypotensive patient. Later, residents participated in a series of simulated cases of undifferentiated hypotension. Participants were randomized into simulator and control groups. The simulator group had access to a low-cost, open-source EDUS2 ultrasound simulator. When the EDUS2 probe was placed on the simulation mannequin, a video clip appropriate for the exam location and case pathology was displayed on the simulator. The control group did not have an EDUS2 simulator available, but the same ultrasound clips were displayed if residents stated their intention to perform a study. Residents completed a second survey after the simulated cases.

Results: Residents in the simulator group performed more components of the RUSH exam per case than those in the control group (4.35 vs 2.45, $p<0.01$). Residents in the simulator group reported more confidence using ultrasound to evaluate undifferentiated hypotension than those in both the control group (5.77 vs 4.91, $p=0.03$) and the group of residents who did not participate in the simulation (5.77 vs 4.14, $p<0.001$). There was minimal correlation between reported pre-simulation comfort with ultrasound and number of RUSH exam components performed ($R=0.28$, $R^2=0.02$).

Conclusion: The residents with access to the simulator utilized ultrasound more, and had increased comfort with using ultrasound in management of hypotension. This suggests that a low-cost, low-fidelity ultrasound simulator enhances ultrasound education when used in simulated cases, above and beyond the effect of simulated cases alone.

629 Teaching Chest Tubes: Simulation Task Trainer or Cadaver Model?

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Background: Both cadavers and simulation task trainers have been used in residency education for procedural training. To date, there is no study specifically comparing the effectiveness of these two models at teaching chest tube insertion.

Objectives: To compare simulation task trainer (sim) versus cadaver for teaching chest tube insertion to Emergency Medicine (EM) and surgery residents.

Methods: This is a prospective, randomized study consisting of PGY1/2 EM and surgery residents at a teaching hospital. Residents were randomized based on experience of < 4 or $\geqq 4$ prior chest tubes into either sim or cadaver groups. Deliberate practice training was done individually with a single trained faculty member on either an embalmed cadaver or TraumaMan task simulator. Primary outcomes are confidence in placing a chest tube and ability to place a chest tube in a clinical setting during the 6 months following initial training session.

Results: Sixteen residents (8 EM, 8 surgery) participated in the study and were randomized to cadaver group (n=8) and simulation group (n=8). No significant differences in characteristics existed between the two groups in terms of age, prior experience or pre-study confidence. Mean pre-training confidence levels were low for both groups, 2.50 (95%CI 0.8-4.2) for cadaver v 3.00 (95% CI 0.9-5.1) for sim, $p = 0.70$. After training, both groups had a statistically significant increase in mean confidence, 8.00 (95% CI 2.4 -10), $p = 0.002$ for cadaver and 8.13 (95%CI 2.4-10), $p <0.001$ for sim group but there was no statistical significance between group confidence levels, $p =0.85$. Data is still being collected for six month clinical setting follow up.

Conclusion: Both simulation and cadaver models for teaching chest tube insertion are associated with significant increased confidence of junior residents. There is no statistically significant difference in increased learner confidence between either model after initial training. The next step is determining which model may better prepare residents for clinical setting.

630 Validation of Medical Students as Quality Observers During Emergency Resuscitation Events

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Background: Proper evaluation of code team performance remains a challenging task. Self-reported retrospective data is often incomplete or biased, while recording for later expert review is not permissible due to medical legal concerns. An alternate approach may be to train pre-clinical medical students to provide unbiased real time evaluation of code team performance.

Objectives: To assess the ability of pre-clinical medical students to evaluate code team performance in comparison to a resuscitation expert.

Methods: A Simulation Director with a decade of experience in evaluating and educating code teams created an online curriculum to train students to assess code team performance within eight key constructs; teamwork, orientation, transparent thinking, communication, role clarity, pulse checks, compressor change, and compression interruption. After completion of this module, 29 students evaluated videos of twelve simulated code scenarios. To provide a comparison to practicing clinicians, two attending physicians also completed the training module and evaluated the twelve scenarios. Using the weighted Kappa statistic, agreement between student and resuscitation expert, as well as attending physician and resuscitation expert were determined.

Results: There were a total of 1,072 student and 96 physician observations. Agreement between students and expert reached a maximum of 0.29 for the teamwork, orientation, transparent thinking, communication, role clarity, or compressor change, but exceeded 0.50

for both pulse checks and interruption. Agreement between attending and expert reached a maximum of 0.43 for teamwork, orientation, transparent thinking, communication and role clarity, but exceeded 0.58 for pulse checks, compressor change, and interruptions.

Conclusion: Pre-clinical medical students are able to evaluate objective constructs of pulse checks and compression interruptions. However, neither students nor practicing clinicians are able to reliably assess more subjective constructs. Additional training in the evaluation of subjective performance constructs is needed to teach both students and practicing clinicians to reliably evaluate and better educate code teams.

631 Isolated Positive LOC Status: Is Brain CT Always Necessary?

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Background: A report of loss of consciousness (LOC) is frequently considered reason enough to obtain a computed tomography (CT) scan in the evaluation of patients with blunt head trauma. In recent years, there has been an increasing reliance on CT scan in such situations. The goal in mind is to reduce exposure to radiation without missing clinically important injuries.

Objectives: To determine the correlation of LOC status on brain CT result in patients with blunt head trauma. Also, to determine whether there is a subset of patients with head trauma in whom clinically important intracranial injuries can be ruled out without obtaining a brain CT scan.

Methods: This is a retrospective study conducted in the emergency department of a busy inner-city teaching hospital. The population included patients ranging between 13 and 35 years of age, with blunt head trauma, who presented to the emergency department (ED) between January, 2007 and December, 2013. Patients were classified into two groups: "LOC" group and "No LOC" group. The results of brain CT scans from each group were compared with LOC status. For study purposes, "clinically important" CT findings were those that required interventions or ICU hospitalization for at least >24 hours or increased length of hospitalization. The results were analyzed using Chi square calculations.

Results: During the study period, 494 patients were identified with head trauma. Of these, 185 (37.5%) reported LOC and 309 (62.5%) did not lose consciousness. In the LOC group, 15 (8.1%) had significant CT findings compared to 1.3% (4/309) of those without LOC ($p<.001$). Of the 4 who had no LOC and had significant brain CT findings, all 4 patients had positive physical findings of head, neck or facial trauma.

Conclusion: In this limited sample, a small proportion of patients with LOC had CT findings requiring intervention. Patients with no LOC and no physical injuries to the head, neck or face had no significant brain CT findings. The only patients with negative LOC who showed significant CT findings were those who demonstrated visible signs of head of face trauma on physical examination. This suggests that isolated LOC without any other symptoms and signs may be not warrant brain CT scan. Further prospective studies are necessary in order to confirm these results.

632 Equivocal Ultrasound Findings for Suspected Appendicitis in Children: Radiology and ED Provider Factors in Secondary Imaging

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Background: Ultrasound (US) is used to diagnose appendicitis (APP) in children in general and pediatric emergency departments (PED). Selection of imaging is at the discretion of ED providers to guide choice if initial US is equivocal (EQ). Utilization of secondary imaging (SI) for APP by adult (AEM) versus pediatric (ED) providers is not well-characterized. To guide clinical decisions, providers rely on radiology reports produced by adult (AR) and pediatric (PR) radiologists. Limited data exist regarding rate of EQ US reporting by (AR) versus (PR).

Objectives: To analyze the rates of EQ APP reports reviewed by AR versus PR radiologists and to compare SI modality by AEM vs PEM physicians in PED patients with US findings EQ for APP.

Methods: Retrospective review (2003-2013) of a radiology database in a tertiary pediatric hospital (ED vol. 25K) in an academic medical center with pediatric and adult radiologists and EM providers. Inclusion criteria: abdominal US from children <18 yrs ordered in the pediatric ED for possible APP. US was determined to be EQ if terms "equivocal" or "APP cannot be excluded" were used in final US report. US studies originating from outside hospitals were excluded. SI (repeat US, Computed Tomography CT, Magnetic Resonance Imaging MRI) data from the same ED visit were collated.

Results: 130 out of 2872 (4.5%) US cases were identified as EQ for APP. PR read 73/130 (56%) EQ cases and AR read 57/130 (44%) EQ cases ($p>0.05$). SI was ordered in 42/130 (32%) EQ cases. 96% of SI selections in EQ cases were ordered by PEM compared to 3.9% by AEM ($p<0.05$). PEM ordered a second US in 10/124 (8.0%) EQ cases and a third US in 2/124 (1.6%). No repeat US was ordered by AEM in any EQ case. PEM ordered a CT scan as SI in 30/125 (24%) EQ cases compared to 1/4 (25%) AEM and this was not statistically significant. No children received MRI as SI choice in any EQ cases.

Conclusion: Over a ten-year period, EQ APP US cases were rare and equally distributed between AR and PR. The majority of SI selections were ordered by PEM, and CT was a more popular SI choice by both PEM and AEM if initial US was EQ for APP in children.

633 Sonographic Detection of Impacted Esophageal Foreign Bodies: A Feasibility Study

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Background: Esophageal foreign body (EFB) impaction is the third most common gastrointestinal (GI) emergency behind upper and lower GI bleeding. Diagnosis can be challenging, particularly in a poor historian or pediatric patient. While computed tomography (CT) is considered the gold standard imaging method in stable patients, this modality is not 100% sensitive or always feasible. Plain film radiography ranges from 42-80% sensitivity, and barium swallow may interfere with subsequent esophagogastroduodenoscopy (EGD). To our knowledge, the utility of Emergency Ultrasound (EUS) in the setting of EFB impaction is unknown.

Objectives: We set out to determine if EUS is a feasible bedside imaging tool for detection of EFB impaction, and to describe common sonographic findings.

Methods: We enrolled five patients with suspected EFB impaction prior to conventional imaging or endoscopy. Findings of interest included esophageal dilatation, persistent air-fluid levels after swallowing, or direct EFB visualization. We compared sonographic findings to esophageal ultrasound in five healthy control subjects.

Results: In all affected study subjects, EUS clearly demonstrated cervical esophageal and gastroesophageal junction (GEJ) anatomy. All patients with suspected EFB impaction had cervical esophageal dilatation and persistent air-fluid levels compared to the control group (Table 1, Figure 1). In 60% of the affected subjects, a cervical EFB (2 patients) or GEJ foreign body (1 patient) was sonographically

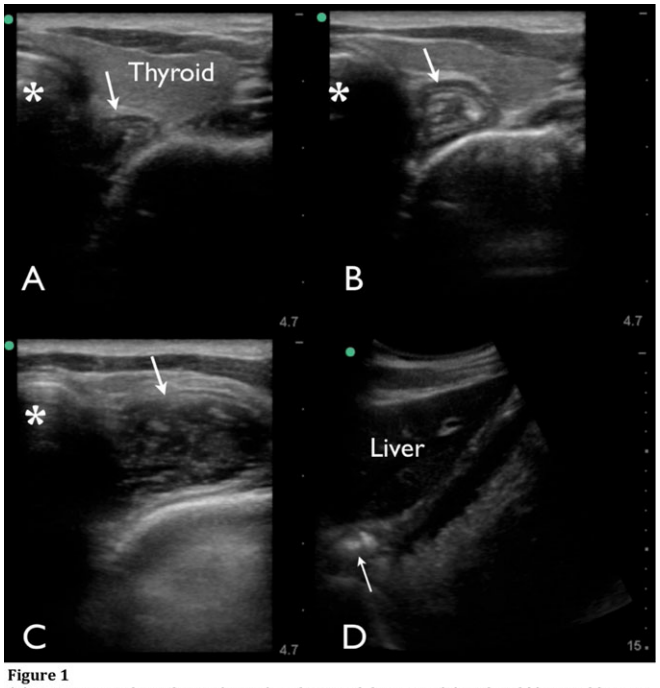

Figure 1
(A) Upper cervical esophagus (arrow) with normal diameter; (B) with mild lumen dilatation in mid-cervical esophagus (arrow); and (C) significant dilatation to > 3cm diameter and fluid pooling in lower cervical esophagus (arrow). (D) The same patient shows the gastro-esophageal junction with impacted foreign body (arrow) confirmed on EGD. *= Trachea

Subject	EFB seen by EUS	Persistent air-fluid level after swallowing	Measured esophageal diameter (mm)	Foreign body on EGD
Subject #1	Yes, GEJ	Yes	32.1 x 15.9	Yes
Subject #2	Yes, lower cervical	Yes	15.0 x 14.1	Yes
Subject #3	Yes, lower cervical	Yes	20.1 x 15.8	Yes
Subject #4	No*	Yes	17.9 x 17.0	No
Subject #5	No	Yes	14.0 x 13.1	Yes
Control #1	No	No	9.3 x 7.8	N/A
Control #2	No	No	8.5 x 5.8	N/A
Control #3	No	No	11.0 x 11.3	N/A
Control #4	No	No	13.7 x 8.4	N/A
Control #5	No	No	10.0 x 8.6	N/A

Table 633: Singleton.

visualized. In one patient, neither EUS nor EGD found an EFB. This patient had significant vomiting during EUS and prior to EGD. There was a significant difference in mean cervical esophageal diameter between the control group (9.3 mm) and subjects with suspected EFB (17.5 mm); p=0.0011, paired t-test.

Conclusion: In patients with suspected EFB and cryptic or unreliable history, ultrasound may identify those at risk for EFB impaction. Sonographic findings suggestive of EFB include cervical esophageal dilatation with persistent air-fluid levels or direct visualization of EFB.

634 Limiting Use of Computed Tomography in Minor Head Trauma: Improving Compliance with Clinical Decision Guidelines

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Background: Overuse of computed tomography in patients with minor head injuries is a known issue. The Canadian CT Head Rule (CCHR) clinical decision guideline has been well validated in several studies, yet patients sustaining minor head trauma still incur unnecessary imaging.

Objectives: We sought to determine if an educational program focusing on CCHR usage for ED providers would reduce imaging in minor head trauma.

Methods: A retrospective chart review of ED visits for minor head trauma was performed from January through May 2014. We assessed the adherence rate of ED providers from a single tertiary care ED to the CCHR in minor head trauma prior to an educational intervention. Our intervention included a department-wide educational campaign on the CCHR and indications for use, as well as the integration of a decision rule reminder into our electronic ordering system. We then conducted a similar chart review from January through May 2015. Visits were excluded if there was lack of information or if they did not meet criteria for application of the rule. Chi square analysis was used to compare pre and post intervention adherence rates.

Results: In the pre-education cohort we reviewed 377 visits for minor head trauma, of which 107 were excluded. 270 visits met criteria, and in 89 visits (33.0%) there was disagreement between the CCHR and head CT usage. Of these 89 patients, 83 should not have received a CT according to the rule while 6 should have received one. In the post education cohort, 638 visits for minor head trauma were reviewed, 217 were excluded, and 421 met criteria for analysis. Of these, 106 visits (25.2%) showed non-adherence to the rule, with 101 patients receiving a head CT despite it not being indicated according to the rule. Overall, there was a decrease in unnecessary imaging from 30.7% to 24.0%. This represents a statistically significant decrease in head CT utilization for minor head trauma after the educational intervention (p=0.026).

Conclusion: Education along with order entry prompting can improve adherence to the Canadian Head CT rule for minor head trauma, thereby reducing neuroimaging in this patient population.

635 Validation of a Risk Stratification Score as a Predictor of Neuroimaging in ED Patients with a Headache

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Background: The Equity in Diagnostic Imaging Trial (EDIT) is testing interventions to reduce a known racial disparity in diagnostic imaging for patients who present to the ED with headache (HA). To properly assess the interventions, a method for quantifying clinical risk factors that influence ED decision-making was needed.

Objectives: To evaluate a risk score based on clinical factors as a predictor of neuroimaging to rule out subarachnoid hemorrhage (SAH) in ED HA patients.

Methods: Using literature review and a modified Delphi expert consensus process, the EDIT team developed a Risk Stratification Score

Table 1. Logistic Regression Results for Predicting Neuroimaging for Patients with Headache

Predictor Variables - Binary (major/minor weight)	d.f.	Wald Chi-Square	p-value	Adjusted Odds Ratios	95% CI
Patient Age >50Y (major)	1	96.09	< 0.0001	1.80	1.60-2.03
sBP ≥160 or dBP ≥100 (major)	1	4.86	0.0274	1.16	1.02-1.32
Sudden Onset (major)	1	28.54	< 0.0001	1.40	1.24-1.60
Worst Headache of Life (minor)	1	335.39	< 0.0001	4.71	3.99-5.56
Syncope (major)	1	20.27	< 0.0001	2.56	1.70-3.85
Sub-Arachnoid Hemorrhage in 1st Degree Relative (major)	1	11.94	0.0006	2.56	1.50-4.35
Past Medical History of Sub-Arachnoid Hemorrhage (major)	1	41.12	< 0.0001	4.55	2.86-7.23
Neurological Abnormality (major)	1	109.75	< 0.0001	3.10	2.51-3.83
Neck Physical Exam Abnormality (minor)	1	27.54	< 0.0001	1.79	1.42-2.25

(RSS) to account for clinical factors that influence neuroimaging. The RSS is a weighted summation with major factors (age, elevated BP, patient or family history of SAH, sudden onset HA, syncope, new neurological deficit, altered mental status, pain score ≥8) given double the weight of minor factors (nausea/vomiting, worst HA, stiff neck). Structured chart review was done for ED HA patients from 2/2005 through 7/2014. A logistic regression model, which included race/ethnicity, sex, anticoagulant prescription, insurance type, ESI, migraines, insurance and co-morbidities as covariates, tested all individual risk factors as predictors of ordering neuroimaging. A second logistical model included all covariates and the RSS as a predictor of a neuroimaging order.

Results: 7,760 charts were reviewed: 70.1% female; 15.4% Whites, 35.7% Blacks; 38.0% Latinos; 1.8% Asians; 9.0% others. Table 1 lists individual clinical factors that were significant predictors of neuroimaging in the first model. In the second model, the parameter estimate for the Risk Stratification Score was positive, suggesting that, as the number of risk factors increased, the odds of ordering neuroimaging also increased (OR=1.27, 95%CI 1.24-1.30; *Wald* X^2*(d.f. 1)* =361.35, $p< 0.0001$). In addition, Whites were significantly more likely to have neuroimaging ordered than either Blacks or Latinos (OR=1.96, 95%CI 1.70-2.28; z-score=8.94, p< 0.0001) even when accounting for clinical risk factors.

Conclusion: The EDIT Risk Stratification Score was a positive independent predictor of neuroimaging; nonetheless, a racial disparity persisted even when accounting for the RSS. This risk score can be used to control for appropriateness of neuroimaging when evaluating the EDIT interventions.

636 The Development and Evaluation of an Assessment Tool for Competency in Point-of-Care Ultrasound in Emergency Medicine

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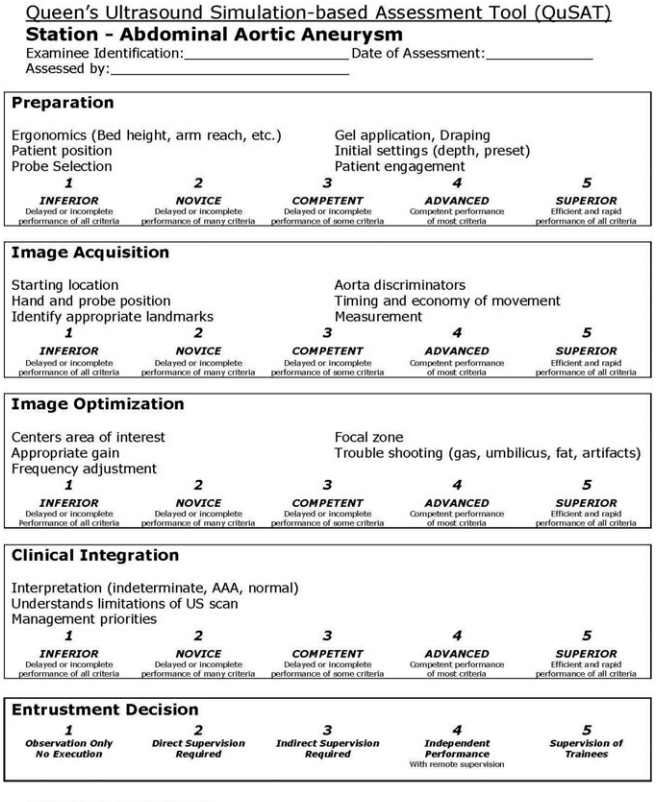
Background: Emergency Medicine (EM) postgraduate training programs are moving towards competency-based education. Currently, point-of-care ultrasound (POCUS) competency is determined by completion of a specified number of supervised scans (50) in each core application without standardized objective assessment.

Objectives: Our aim was to develop and evaluate an assessment tool for EM resident competency in POCUS: the Queen's Ultrasound Simulation Assessment Tool (QuSAT).

Methods: A comprehensive literature review and a modified Delphi technique were used to develop a modifiable, anchored global assessment tool based on a previously validated simulation assessment tool. The QuSAT contains four domain-specific anchored scores (preparation, image acquisition, image optimization, clinical integration) and an Entrustment Score (Image). Residents completed a simulated POCUS station for the assessment of abdominal aortic aneurysm in a standardized patient. A POCUS fellowship-trained EM physician scored all performers. Correlation analysis and analysis of variance were performed.


Queen's Ultrasound Simulation-based Assessment Tool (QuSAT)
Station - Abdominal Aortic Aneurysm
Examinee Identification:_____ Date of Assessment:_____
Assessed by:_____

Preparation
Ergonomics (Bed height, arm reach, etc.)
Patient position
Probe Selection
Gel application, Draping
Initial settings (depth, preset)
Patient engagement

1	2	3	4	5
INFERIOR	NOVICE	COMPETENT	ADVANCED	SUPERIOR
Delayed or incomplete performance of all criteria	Delayed or incomplete performance of many criteria	Delayed or incomplete performance of some criteria	Competent performance of most criteria	Efficient and rapid performance of all criteria

Image Acquisition
Starting location
Hand and probe position
Identify appropriate landmarks
Aorta discriminators
Timing and economy of movement
Measurement

1	2	3	4	5
INFERIOR	NOVICE	COMPETENT	ADVANCED	SUPERIOR
Delayed or incomplete performance of all criteria	Delayed or incomplete performance of many criteria	Delayed or incomplete performance of some criteria	Competent performance of most criteria	Efficient and rapid performance of all criteria

Image Optimization
Centers area of interest
Appropriate gain
Frequency adjustment
Focal zone
Trouble shooting (gas, umbilicus, fat, artifacts)

1	2	3	4	5
INFERIOR	NOVICE	COMPETENT	ADVANCED	SUPERIOR
Delayed or incomplete Performance of all criteria	Delayed or incomplete performance of many criteria	Delayed or incomplete performance of some criteria	Competent performance of most criteria	Efficient and rapid performance of all criteria

Clinical Integration
Interpretation (indeterminate, AAA, normal)
Understands limitations of US scan
Management priorities

1	2	3	4	5
INFERIOR	NOVICE	COMPETENT	ADVANCED	SUPERIOR
Delayed or incomplete performance of all criteria	Delayed or incomplete performance of many criteria	Delayed or incomplete performance of some criteria	Competent performance of most criteria	Efficient and rapid performance of all criteria

Entrustment Decision

1	2	3	4	5
Observation Only No Execution	Direct Supervision Required	Indirect Supervision Required	Independent Performance With remote supervision	Supervision of Trainees

Additional Comments:

Figure 636 – Dashi

Results: Twenty-six postgraduate EM trainees participated in the study. Discriminatory capability was strong with upper year trainees significantly outperforming first year trainees in total QuSAT and Entrustment Scores. Residents with ≥50 supervised scans significantly outperformed those with <50 scans in total QuSAT and Entrustment Score. Notably, the mean Entrustment Score for residents with ≥50 scans was 4.1/5, corresponding with the competency descriptor "independent performance". There was strong correlation between total QuSAT score and Entrustment Score (r=0.902). Trainees reported comfort with the assessment (4/5) and found the exam similar to real life (4.6/5).

Conclusion: This study demonstrates the development and evaluation of a modifiable, anchored global assessment tool for the evaluation of POCUS competency in postgraduate EM trainees. We anticipate this work will contribute to the development of a standardized objective assessment process for all POCUS core applications in EM postgraduate programs.

637 Emergency Medicine Physician Sonographers Can Identify and Inject the Regions of the Trigeminal Nerve Foramina in a Cadaveric Model

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Background: The trigeminal nerve, (CN V) is the predominant sensory nerve of the face. Nerve blocks may be preferred over local anesthesia for painful procedures in this area due to the lower volume of anesthetic required for adequate analgesia as well as decreased distortion to the tissue requiring repair. Nerve blocks are particularly suited to the face because of the nerves' superficial location and limited overlap between adjacent nerve distributions. Regional CN V blocks are traditionally guided by the localization and palpation of landmarks. Since several branches of this nerve exit the skull through foramina, ultrasound may aid in anatomic identification and needle guidance. The supraorbital, infraorbital and mental foramina are amenable to such visualization.

Objectives: This study evaluated emergency physicians' (EPs) ability to identify these foramina and the feasibility of using ultrasound to guide proper placement of injection.

Methods: Five EPs sonographically evaluated these foramina in five embalmed human cadavers. Once each foramen was identified, 3cc of normal saline was injected, attempting to create a hypoechoic area of fluid surrounding the defect in the cortical bone. Each sonographer filled out a data form noting his/her ability to identify each foramen.

Results: Sonographers were able to visualize all 30 foramina with a still image demonstrating a defect in the cortical bone. All injections were performed with good visualization of hypoechoic fluid surrounding the foraminal area. The sonographers did not report any difficulties.

Conclusion: Since the exact location of the facial foramina may vary, reliance on surface landmarks may lead to erroneous anesthetic deposition and potential nerve or arterial injury. Ultrasound may be a useful tool to identify bony foramina and thus nerve location for facial blocks. In this study, EPs were able to easily identify the three CN V foramina and inject normal saline at these sites in a human cadaveric model. Further study of the use of ultrasound guidance in a clinical setting may elucidate success as well as complication rates compared to surface landmark guidance.

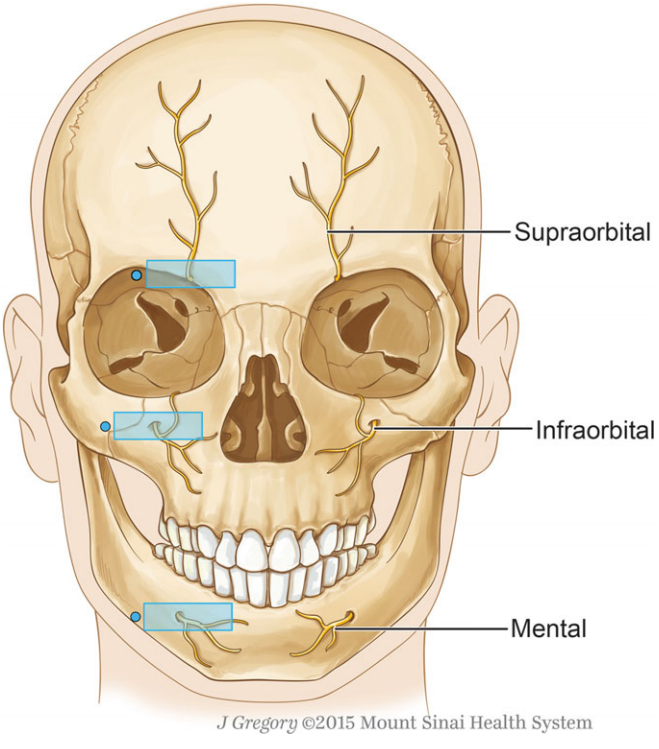

Figure 637 – Saul

638 Ultrasound Guided Fascia Iliaca Block Using a Novel Porcine Model

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Eastern Virginia Medical School, Norfolk, VA

Background: Fascia iliaca block (FIB) is a minimally invasive procedure for analgesia in hip fracture patients in the emergency department (ED) and operating room (OR). Ultrasound (US) guidance and the use of simulation models helps to reduce procedure associated morbidity. Unfortunately the cost of commercially available training models can be a significant barrier to simulation training.

Objectives: We prospectively evaluated emergency medicine (EM) provider's performance, degree of satisfaction, and degree of realism when performing US guided FIB utilizing a novel porcine model (~$20) versus the commercially available Blue Phantom model (~$4,000).

Methods: This was a prospective observational crossover cohort study. After a procedure education session participants were required to perform a FIB in both the porcine and commercial models. The primary objective measurements recorded were proper transducer manipulation, needle tip visualization, use of hydro-dissection, the number of passes of the needle, overall success rate, the number of vessel/nerve punctures, and operator's assessment of both degree of satisfaction and degree of realism of both models.

Results: Twenty-three EM providers participated in the study. There was no statistically significant difference in success rates, number of needle passes or vessel/nerve penetrations between the Porcine and Blue Phantom model. Operator assessed degree of satisfaction as rated on a 10-point Likert scale, with 10 being most satisfied, was 8.17 for the porcine model and 6.52 for the commercial model, $p = 0.0019$. Operator assessed degree of realism was rated on a 10-point Likert scale, with 10 being most realistic, was 8.13 for the porcine model and 6.00 for the commercial model, $p = 0.0005$.

Conclusion: There was no statistical difference in EM physician performance of FIB using the porcine model as compared to the commercial phantom. The inexpensive porcine model was rated superior to the commercially available model in operator-assessed degree of realism and satisfaction. Inexpensive simulation models have the potential to make invasive procedure training more accessible to providers.

639 A Comparison of Weight Estimation Tools in an Urban Pediatric Population

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Background: Accurate weight estimation during acute pediatric resuscitative efforts is vital to provide optimal care. The rise in pediatric obesity makes this more and more challenging. A previous study was done at our institution, comparing the accuracy of 4 commonly used pediatric weight estimation tools on our inner-city pediatric population, which has a high obesity rate. All 4 methods performed poorly.

Objectives: This study will further compare the fingercounting (FC) method to the method found to be most accurate in this previous study (PAWPER tape formulation) as well as to the most popular method (Broselow tape).

Methods: A subset of data obtained from a previous prospective, nonblinded, observational study was used for this study. Our data consisted of 258 patients ages 1 to 9 years. We applied the FC method to this data and compared the results to that of the PAWPER tape formulation and the Broselow tape estimation. Fractions of accuracy within 95% confidence interval were compared and analyzed.

Results: We compared the FC method with the other methods using a 5% acceptable error range. The FC method miscalculated weight more frequently, estimating patients' weight within the acceptable range in only 23.3% of our cohort. PAWPER and Broselow estimated weights were in the acceptable range in 32.2% and 37.6% of our subjects, respectively. There was no statistical significance in the proportion of error between the PAWPER and Broselow methods, however, the proportion of error between PAWPER and FC, and between Broselow and FC were found to be significant with P values 0.0006 and 0.02 respectively.

Conclusion: In pediatric populations with endemic obesity, currently available modalities for estimating weight perform poorly. Continued effort should be made to devise a universal tool that will improve weight estimation for use during acute pediatric resuscitations.

640 Recognition of Sexually Transmitted Infections (STI) in Adolescent Females with Symptoms of Urinary Tract Infection (UTI)

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Background: Sexually transmitted infections (STI) are a frequent problem in adolescents. Symptoms may be vague, and patients may not reveal high-risk sexual behavior. Symptoms may include abdominal or pelvic pain, dysuria, vaginal discharge. In addition, urinalysis may show nonspecific signs of infection, leading to inappropriate treatment for urinary tract infection (UTI).

Objectives: To determine the accuracy of STI and UTI diagnosis in symptomatic adolescent females in the pediatric emergency department (ED).

Methods: Over a three month period, from January 1 to March 31, 2015, adolescent females presenting to the ED with abdominal pain, pelvic pain, urinary symptoms, flank or back pain, or concern for STI were reviewed. Those with alleged sexual assault or abuse were excluded. All patients were screened for STI. Results of urinalysis and urine culture were reviewed. Urine cultures were considered positive if they grew >100,000 cfu/ml of known pathogen from a clean catch urine sample, or 50,000 cfu/ml or more from a catheter specimen. Urinalysis (UA) was considered abnormal with leukocyte esterase (LE) small or greater, positive nitrites, or WBC >10.

Results: Of 175 patients studied, 109 received no ED treatment UTI or STI, with 14 with positive STI tests and 2 positive urine cultures. Twelve patients were treated for UTI; of these 4 had positive urine cultures and 4 had positive tests for STI. Thirty-five patients were treated for STI, with 13 positive tests for STI and 4 positive urine cultures. Three patients received treatment for both UTI and STI while in the ED, with 2 positive urine cultures and 2 positive STI tests (both Trichomonas). The overall incidence of Chlamydia was 11.4%, Gonorrhea was 3.4%, and Trichomonas was 7.6%. Forty-five of 159 patients had an abnormal UA, 13, (29%) had positive urine culture. Of those with abnormal UA, the incidence of chlamydia was 20%, gonorrhea 7%, and trichomonas 18%. Sixteen of those with abnormal UA had no urine culture performed.

Conclusion: Symptoms of UTI and STI are very similar in adolescent females. There are a significant number of missed infections, both of STI and UTI. Treatment of both STI and UTI should be considered in those high-risk patients with abnormal UA.

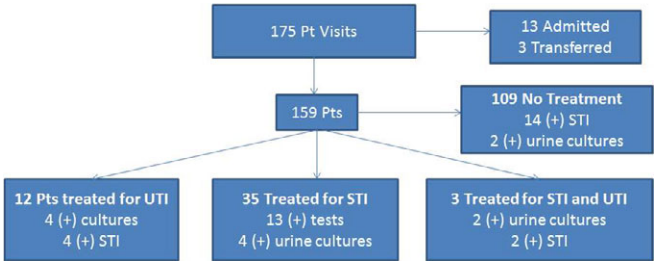

Figure 640 – Stukus

641 Frequency and Characterization of Tracheal Intubation Adverse Events in Pediatric Sepsis

Sarah Schmidt[1], Lina Brou[1], Sara Deakyne[2], Rakesh Mistry[1], and Halden Scott[1]
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Background: Tracheal intubation adverse events (TIAE) occur in up to 20% of critically ill children intubated in the pediatric intensive care unit (PICU). However, rates of TIAE in pediatric sepsis, including those in the emergency department (ED) have not been characterized.

Objectives: To describe characteristics of emergent intubation and the frequency and types of TIAEs in septic children.

Methods: This was a retrospective cohort study of septic children ≥ 60 days- 18 years requiring emergent intubation. Subjects were identified from an ongoing prospective sepsis registry. Patients intubated electively, prior to arrival, > 24 hours after ED presentation, or with tracheostomy tubes were excluded. TIAEs were defined using established definitions from the NEAR collaboration. Details of intubation procedures were collected, including clinician type, pre-existing conditions, and success rate.

Results: From 4/2012-6/2015, 119 of 274 patients (43%) met inclusion criteria; 62% had an underlying chronic medical condition, and 5% had a known difficult airway. 100% of intubations were successful; 60% occurred in the ED, and 28% in the PICU. First attempt success rate was 58%; 80% were intubated with ≤ 2 attempts. First attempt was by a resident (31%), a fellow (41%), an attending (6%), and an anesthesiologist (14%). 61 TIAEs were reported in 49 (42%) intubations, most frequently mainstream bronchial intubation in 28 (24%) intubations. 22 Severe TIAEs, including two cardiac arrests, occurred in 20 (17%) intubations, with hypotension being the most common (20;17%).

Conclusion: TIAEs occurred in a large proportion of septic children, including many with severe TIAEs such as hypotension. Rates of TIAEs are higher in sepsis compared to other non-elective pediatric intubations, highlighting the high-risk nature of this procedure in pediatric sepsis. Optimal strategies for intubation in pediatric sepsis must be further investigated.

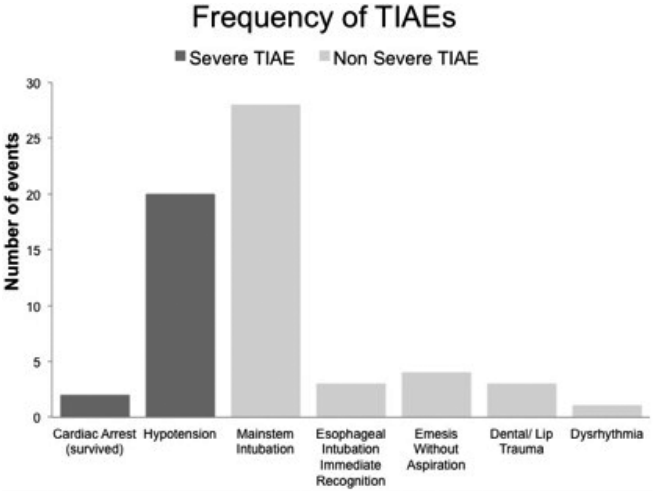

Figure 641 – Schmidt

642 A Prospective Investigation Validating the Performance of an Emergency Department Formula for the Diagnosis of Acute Kidney Injury in Pediatrics

Marie-Carmelle Elie, Azra Bihorac, Nastasia James, Emily Weeks, Robert S. Wills, Anna Mazzuoccolo, Michael Marchick, Brandon Allen, and Mark S. Segal

University of Florida, Gainesville, Gainesville, FL

Background: Acute kidney Injury (AKI) is increasingly recognized as a prevalent and independent predictor of poor outcomes and death among seriously ill children. Early recognition of AKI may provide opportunities for early intervention and preventative measures. However, the diagnosis is typically delayed. Widely accepted rules such as AKIN, pRIFLE, and KDIGO require a baseline serum creatinine (SCr) level and height/length measurements to calculate glomerular filtration rate which are not part of routine emergency department (ED) management.

Objectives: To validate the performance of a modified ED based rule, P_{ED}RIF to diagnose AKI in the acute setting when baseline SCr and height/length data is not available.

Methods: A prospective evaluation of 101 children <18 years of age was conducted from July 1, 2013 to June 1, 2015 at a single academic pediatric ED. Inclusion criteria were consenting patients who were awaiting hospital admission in ED and had laboratory samples obtained. Patients were excluded if they had a diagnosis of chronic kidney disease, dialysis, or renal transplantation. AKI was ascertained using SCr obtained in the ED to estimate creatinine clearance (CrCl) using the stratified into Risk, Injury, or Failure by p_{ED}RIF. Urine samples were collected in the ED in order to assess presence of urinary, kidney, injury biomarkers: kidney injury molecule (KIM-1) neutrophil gelatinase-associated lipocalin (NGAL), alpha and pi glutathione S-transferase (alpha GST, pi GST), and liver-fatty acid fatty binding protein (L-FABP). Clinical providers were blinded to experimental measurements.

Results: Of 101 subjects enrolled, 65 had a SCr measurement available. Of these patients, 11% (7/65) had AKI by p_{ED}RIF. Children with AKI by p_{ED}RIF had a mean CrCl of 56 mL/min/1.73 m^2 (SD 15.7) and statistically significant higher markers of kidney injury, NGAL, and pi GST. Reduced estimated CrCl by p_{ED}RIF was associated with a relative increase in the injury biomarkers KIM-1, alpha GST and L-FABP; this association was not statistically significant.

Conclusion: This preliminary study demonstrates the P_{ED}RIF rule may be applied in the emergent setting using readily available laboratory data to detect AKI in children.

Urinary and serum biomarker concentrations in AKI vs non-AKI patients diagnosed by P_{ED}RIF.

Biomarker	No AKI by p_{ED}RIF (N = 58) Median Assay 1, Assay 2	AKI by p_{ED}RIF (N = 7) Median Assay 1, Assay 2	p-value
KIM-1	0.11 0.11	0.16 0.17	0.29
NGAL	0.0 0.0 75%:0.54, 0.65	0.69 0.79 75%:3.26, 3.15	0.02
Alpha GST	1.95 1.84	2.39 2.74	0.67
Pi GST	8.89 8.20	19.86 21.92	0.01
L-FABP	0.0 0.0 75%:9.27, 8.20	14.32 12.17 75%:26.95, 25.68	0.09
Serum Cr	0.40 (mean 0.45)	0.50 (mean 0.88)	0.02
Estimated CrCl	118 (mean 123)	58 (mean 57)	-

KIM-1: kidney injury molecule; NGAL: neutrophil gelatinase-associated lipocalin; alpha GST: alpha glutathione S-transferase; pi GST: pi glutathione S-transferase; L-FABP: liver fatty acid fatty binding protein.

Because NGAL and L-FABP had over 50% with undetectable levels with no AKI by P_{ED}RIF, the 75th percentile (75%:) is listed for these two variables.

Table 642: Elie.

643 How Well Does Modified Pews Apply to Different Hospital Departments? Pediatric Early Warning Score at A Community-Based Teaching Hospital: Evaluation of Implementation

Margaret Menoch, Alyssa Vermeulen, and Kelly Levasseur
William Beaumont Hospital, Royal Oak, MI

Background: A variety of pediatric early warning score (PEWS) systems have shown potential to identify evolving critical illness for different pediatric departments, with any score ≥3 directing clinical action. It is unknown how well this scoring system performs when implemented hospital-wide with pediatric patients.

Objectives: Evaluate the clinical utility modified PEWS system implementation for hospital wide community based teaching hospital by analyzing compliance, clinical acknowledgment of high scores, and if actions were taken for a high score. The emergency department data was then compared to the in-patient data.

Methods: We reviewed all pediatric emergency department and pediatric inpatient visits during the first six months of modified PEWS implementation, extracting data for any high risk patient (score ≥3). These charts were individually reviewed for any note addressing the high score, any order placed at the time of the high score, or if the patient was transferred to a higher level of care.

Results: Out of the 16,632 visit total, 70% had a PEWS recorded. Of the scores obtained, 83% were obtained in the emergency department. Our cohort of interest with a score ≥ 3, was 8% (1,318) of these patients. Of these, 55.6% had a score of 3, with 45.4% scoring higher. The median time to obtain a score was 46 minutes, with a median hospital length of stay 1.6 days. Of these high scoring patients, 97% did not have any form of documentation acknowledging the high risk score, and 63% had no intervention. Of the interventions performed, 10% of the patients had supplemental oxygen given, 10% had intravenous fluids given, and 13% had a medication given. PICU transfers occurred in 4.6% of these cases.

Conclusion: Implementation of a PEWS system likely has many challenges for compliance within different pediatric departments of the same hospital system, explaining the large compliance difference seen between our emergency department and pediatric inpatient units. If the high score is not being acknowledged or acted upon, it is unknown if the patient was truly decompensating or if the PEWS scored high but was not clinically useful (a false trigger).

644 The Use of Procalcitonin for Prediction of Pulmonary Bacterial Co-Infection in Children with Respiratory Failure Associated with Viral Bronchiolitis

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Background: Viral bronchiolitis is a frequent diagnosis in pediatric patients and is a cause of morbidity and mortality, including respiratory failure. Procalcitonin (PCT) is a biomarker used to identify serious bacterial infection and has had success distinguishing bacterial and viral infections when compared to other biomarkers.

Objectives: Concomitant bacterial pneumonia is not rare (17-44%) and can lead to a worse clinical course and poorer outcomes. No current serum lab tests exist that can differentiate between bacterial and viral processes. This study examined the use of PCT in pediatric patients with respiratory failure attributed to viral bronchiolitis to predict concomitant bacterial pneumonia.

Methods: This prospective descriptive study evaluated children less than 4 years of age that underwent endotracheal intubation for respiratory failure due to viral bronchiolitis. PCT levels and endotracheal aspirate cultures were obtained. Pneumonia was defined as at least moderate growth of a single pathogenic organism from endotracheal culture. PCT levels were evaluated in groups with and without concomitant bacterial pneumonia.

Results: Thirty-five patients were enrolled between Feb. 2013 and May 2015. All subjects tested positive for at least 1 viral infection by nasal wash polymerase chain reaction (PCR) or enzyme immunoassay (EIA). The top viruses obtained were Respiratory Syncytial Virus (RSV) (n=15, 42.8%) and Rhinovirus (n=8, 22.9%) with 6 patients having a combination of 2 or more viruses simultaneously (17.1%). The incidence of bacterial pneumonia was 60% (21/35). The PCT median was 0.93 ng/mL (interquartile range [IQR] 0.17-7.06) in the pneumonia group, and 1.85 ng/mL (IQR 0.24-9.06) in the non-pneumonia group. No correlation was found between PCT and bronchiolitis with co-infection bacterial pneumonia (p=0.74).

Conclusion: Procalcitonin did not predict co-infection with bacterial pneumonia in children with respiratory failure from viral bronchiolitis. Future research should focus on identifying ideal methods to recognize bacterial co-infection in viral bronchiolitis in a reliable and timely manner.

645 Comparison of Length-of-Stay and Adverse Events in Children Undergoing Forearm Fracture Reduction Using Bier Block Versus Procedural Sedation

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Background: Distal forearm fractures are among the most common pediatric injuries. Procedural sedation (PS) is frequently used for analgesia during fracture reduction, but requires a prolonged recovery period and can be associated with adverse respiratory events. Bier block (BB) intravenous regional anesthesia is a safe alternative to PS for fracture reduction analgesia.

Objectives: This study sought to assess the impact of BB on length of stay (LOS) and adverse events following forearm fracture reduction compared to PS.

Methods: We performed a retrospective study of patients aged 6-18 years, presenting to a tertiary pediatric ED with forearm fractures requiring closed reduction from June 2012 to March 2014. The primary outcome measure was emergency department LOS; secondary outcomes included reduction success rates, adverse events and unscheduled return visits.

Results: Two-hundred and seventy-four patients were included; 109 treated with BB, 165 underwent PS. Overall, mean LOS was 82 min shorter for BB patients (279 min vs. 361 min, p<0.001). Sub-analysis revealed a reduced LOS among BB patients with fractures involving a single bone (286 min vs. 388 min, p<0.001) and both-bones of the forearm (259 min vs. 321 min, p<0.05). Reduction success did not differ between BB and PS (98.2% vs. 97.6%, p=0.74). There were no major adverse events in either group, however, BB patients experienced fewer minor adverse events (2.7% vs. 14.5%, p<0.001). Return visit rates were similar between BB and PS (17.6% vs. 16.9%, p=NS).

Conclusion: Compared to PS, forearm fracture reduction performed with BB was associated with a reduced emergency department LOS and fewer adverse events, with no difference in reduction success or return visits.

646 Increased Severity of Weekend Pediatric Road Traffic Injuries: A 10-Year Analysis of Trauma Registry Data in South Africa

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Background: Road traffic injury (RTI) is a significant worldwide cause of pediatric morbidity and mortality, with a disproportionate number occurring in low- and middle-income countries (LMICs). Injury prevention programming requires an understanding of risk factors to direct resources towards interventions likely to have the greatest impact. Whether children are at increased risk of RTI on weekends has not previously been investigated in any setting.

Objectives: This study sought to assess weekend patterns in pediatric RTI presentations over a 10-year period using hospital-based trauma surveillance data in Cape Town, South Africa.

Methods: Data was analyzed from Childsafe South Africa's prospectively collected trauma surveillance registry for injured children aged <13-years, presenting to a tertiary pediatric Emergency Department between 2004-2013.

Results: A total of 71,180 patients presented with traumatic injuries, of which 8,815 (12.4%) resulted from RTIs. RTI patient median age was 4.5-years, and were predominantly males and pedestrians. RTIs were more common on weekends than on weekdays (2.98 vs 2.19 patients/day; 15.5% vs 11.2%, p<0.001). Moreover, injuries sustained by RTI patients on weekends were more severe than on weekdays, and when compared to weekend all-cause trauma patients (injury score 1.66 vs 1.46 and 1.43, p<0.001). RTI patients were more likely to require admission to the trauma ward (1.14 vs 0.79 patients/day, p<0.001) and PICU (0.10 vs 0.07 patients/day, p<0.05) on weekends than on weekdays. There were most weekend RTIs during the last annual quarter, and these also more frequently required admission to the trauma ward and PICU. Weekend Emergency Department mortality secondary to RTI was rare.

Conclusion: In a LMIC setting, pediatric RTI patients are more frequently brought to medical attention, sustain more severe injuries and more frequently require hospital admission during the weekend. These findings highlight the importance of trauma surveillance data to inform targeted community prevention strategies for improving child road safety.

647 Critical Care Ultrasound: A National Survey Across Specialties

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Background: Management of the critically ill requires rapid assessment and differentiation. Point-of-care ultrasound (POCUS) is an available, rapid and noninvasive tool, which improves diagnostic efficiency and accuracy. Despite recommendations from multiple professional organizations, recent studies suggest that POCUS training may not be universally adopted. No previous study has compared utilization of POCUS in the critically ill across specialties.

Objectives: To describe use of critical care related POCUS applications amongst providers in different specialties and identify barriers to implementation.

Methods: This study was conducted as an online survey via the American College of Emergency Physicians Critical Care Medicine section and the American Thoracic Society Critical Care Assembly listserv. Survey questions described level of training, specialty, ultrasound experience, POCUS application preferences and barriers to

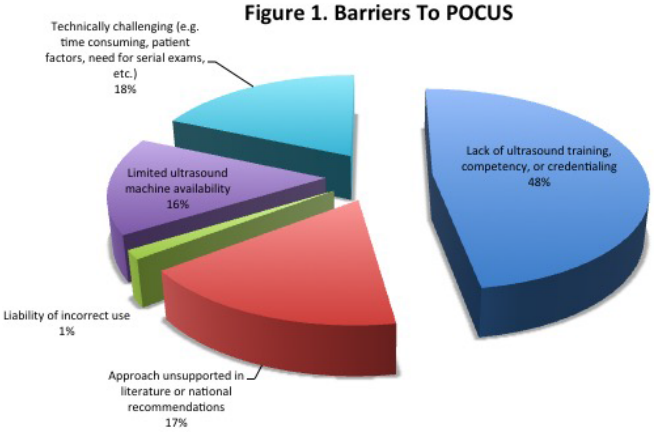

Figure 647 – Stowell

Table 1. Respondent Demographics		Specialty							Total
		Anesthesia/ An. Critical Care	Cardiac Critical Care	Emergency Medicine	Internal Medicine	Other	Pulmonary and Critical Care	Surgery/ Trauma Critical Care	
Level of Experience	Faculty	7 (3%)	6 (2.6%)	34 (10.5%)	7 (3%)	12 (5.2%)	165 (71.1%)	1 (.4%)	232
	Fellow	1 (1.5%)	2 (2.9%)	8 (11.8%)	6 (8.8%)	4 (5.9%)	46 (67.6%)	1 (1.5%)	68
	Resident	0	1 (2.3%)	25 (58.1%)	14 (32.6%)	1 (2.3%)	2 (4.7%)	0	43
	Medical Student	0	0	0	0	2 (100%)	0	0	2
Total		8	9	67	27	19	213	2	345

Table 647: Stowell.

implementation. Responses were evaluated using simple descriptive and comparative analysis.

Results: The survey was viewed by 2735 providers with a total of 416 responses (15.2%). 70 responses were incomplete and removed prior to analyses. Respondent demographics are demonstrated in Table 1. Ultrasound training commonly occurred during a training course (26.2%), fellowship (24.7%), residency (21.3%) or self-guided learning (15.8%). Respondents rated their use as "often" for evaluating undifferentiated hypotension (80.2%), volume status and fluid responsiveness (74.9%), cardiopulmonary arrest (64.5%) and undifferentiated dyspnea (60.5%). Emergency medicine providers utilized POCUS for undifferentiated hypotension ($p<0.001$) and cardiopulmonary arrest ($p<0.001$) significantly more than other specialties. Across specialties, respondents whom rarely utilized POCUS most commonly identified a lack of ultrasound training as a barrier (47.4%). (Figure 1)

Conclusion: Across specialties, there is frequent utilization of POCUS in the evaluation of the critically ill. Emergency medicine providers utilize POCUS for undifferentiated hypotension and cardiopulmonary arrest significantly more than other specialties. Increased formal training may further expand use.

648 Inferior Vena Cava Measurement with Ultrasound: What is the Best View and Best Mode?

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Background: Determining intravascular volume status is vital in the management of the critically ill. However, there is limited data comparing different acquisition techniques for IVC measurement.

Table 1. ICC by Modality and View								
	B-Mode		M-Mode IVCCI		M-Mode, expiratory		M-Mode, inspiratory	
Views	ICC	95% CI	ICC	95% CI	ICC	95% CI	ICC	95% CI
Long Axis	.86	.76 to .92	.14	-.27 to .47	.78	.60 to .88	.57	.19 to .78
Short Axis	.78	.63 to .88	.27	-.11 to .56	.76	.53 to .88	.63	.28 to .81
Coronal Long Axis	.74	.56 to .85	.32	-.08 to .60	.68	.45 to .82	.66	.42 to .81

Table 648: Finnerty.

Objectives: The goal of this evaluation is to determine the reliability of three IVC measurements for volume assessment: sub-xiphoid transabdominal long axis (LA), transabdominal short axis (SA), and right lateral transabdominal coronal long axis (CLA) (aka "rescue view").

Methods: Volunteers were evaluated by three RDMS trained emergency physicians (EP). Measurements of B-mode, and M-mode diameters and IVC collapsibility index (IVCCI) were measured for three anatomic views (LA, SA, CLA). For each IVC measurement, descriptive statistics, intra-class correlation coefficients ($ICC_{2,1}$), and 2-Way Univariate Analyses of Variance (ANOVA) with one repeated measure were calculated. All significant effects were followed with post-hoc analyses.

Results: Thirty nine patients were evaluated yielding 351 total US scans. Measurements of three views had similar means (LA 1.9 ± 0.4; SA 1.9 ± 0.4; CLA 2.0 ± 0.5) B-Mode LA had the highest ICC (0.86, 95% CI = 0.76 to 0.92) while B-Mode CLA had the lowest ICC (0.74, 95% CI = 0.56 to 0.85). ICCs for all M-mode IVCCI were low. Significant interaction effects between anatomical view and EP were observed for B-mode, and M-mode measurements. In each case, one EP's measurements across a subset of views was significantly different from the other two. Post-hoc tests indicate that one judge's measure was different for CLA and another judge's measure was different for SA suggesting difficulty in consistent view acquisition between judges.

Conclusion: Measurements of the IVC performed by EPs demonstrated similar B mode measurements for all three anatomical views (LA, SA, CLA). However, interjudge reliability was best for B-mode LA, and worst for all M-Mode IVC collapsibility indices (IVCCI). These results suggest that B-mode Long Axis View holds the most promise to deliver reliable measures of IVC diameter. Coronal "rescue view" can be used for measurement of IVC diameter but is less reliable. Future studies may focus on assessing IVC diameter in a clinical setting.

649 Ultrasound vs. Blind Incision and Drainage in Skin and Soft Tissue Abscesses

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Background: Soft tissue abscesses are common in the emergency department. Ultrasound can be used to help guide drainage, but incision and drainage (I&D) without ultrasound guidance remains the most common method to treat skin and soft tissue abscesses.

Objectives: We hypothesized that failure rates following ultrasound guided drainage would be less then drainage without ultrasound guidance.

Methods: We performed a retrospective review of adult skin and soft tissue abscess at 4 emergency departments over a 1-year period. Cases were identified through electronic medical record complaints and discharge data. Additional cases were identified through ultrasound database. Data on ultrasound usage, findings and outcomes were abstracted to an electronic database. Post surgical infections, animal bites and soft tissue foreign bodies were excluded. Failure of therapy was defined as the requirement of an additional I&D after the initial visit to the Emergency Department. Planned delayed I&D were not classified as failure. Comparison between group with Fisher's Exact test.

Results: A total of 863 patients were seen over a 1-year period with a skin or soft tissue abscess, as defined as purulence after I&D or

sonographic findings on soft tissue ultrasound. The majority of abscesses were located in the buttock (16%), arm (16%) and head and neck (14%). 834 underwent I&D during their ED stay, 384 with US guidance and 449 without. Failure rate for all patients was 9.83%, with 82 patients returning to the ED for a repeat I&D. Clinical failure was more common after blind I&D, when compared to US guidance (7.0% vs 12.0%, p=0.02). There was no difference in I&D technical failures (defined as empty or blood only after I&D) between US guided or blind I&D (13.9% vs 14.6%, p=ns).

Conclusion: US guided I&D has a lower clinical failure rate then blind I&D for skin and soft tissue abscesses in the Emergency Department.

650 Evaluation of Suspected Skin Abscesses with Ultrasound Improves Outcome

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Background: Soft tissue abscesses are common in the emergency department. Ultrasound can improved diagnostic accuracy for patients with suspected skin abscess, but it is not used in all cases.

Objectives: We hypothesized that failure rates in patients with suspected skin abscess evaluated with ultrasound would be lower then in patients evaluated by history and physical alone.

Methods: We performed a retrospective review of adult skin and soft tissue abscess at 4 emergency departments over a 1-year period. Cases identified through electronic medical record complaints and discharge data, as well as patients who underwent a soft tissue ultrasound. Data on ultrasound usage, findings and outcomes were abstracted to an electronic database. Failure of therapy was defined as the requirement of an additional incision and drainage (I&D) after the initial visit to the emergency department. Patients with planned delayed I&D were not classified as a failure. Comparison between group with Fisher's Exact test.

Results: A total of 1281 patients were seen over a 1-year period with concern for a potential skin or soft tissue abscess. 447 (34.9%) of patients were diagnosed with a diagnosis other then a skin abscess and were discharged without I&D. The most common locations were upper extremity (23%), head and neck (15%), torso (11%) and buttock (10%). Of these patients, 357 or 79.9% underwent ultrasound imaging prior to discharge. 26 patients who were discharged after ultrasound imaging returned for I&D (failure rate 7.3%) compared to 24 of 90 patients discharged without ultrasound imaging (failure rate 26.7%, p<0.001). Patients returned an average of 3.3 days later for I&D.

Conclusion: Ultrasound imaging in patients with suspected skin and soft tissue abscess decreases failure rates for those patients treated without I&D.

651 Longevity and Complication Rates of Ultrasound Guided Versus Traditional Peripheral Intravenous Catheters in a Pediatric Emergency Department

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Background: Ultrasound guided peripheral IVs (USGPIVs) are frequently used in patients with difficult access. We have previously reported on longevity and complication rates of USGPIVs, but there are limited data on outcomes of USGPIVs compared to traditional peripheral IVs (TPIVs) in children.

Objectives: To compare the longevity and complication rates of the USGPIVs versus TPIVs placed in a pediatric ED.

Methods: A training program for USGPIVs began in our ED in 2013 as part of a hospital-wide quality improvement initiative for difficult IV access. All ED USGPIV attempts from August 2013 - April 2014 were recorded on a data form, and patient electronic medical records (EMR) were analyzed to determine the reason and timing for IV removal along with any complications. During this same time period, similar data for TPIVs were obtained by randomly sampling our EMR for patients with diagnoses (sickle cell disease, diabetes, febrile neonates, and vomiting/dehydration) likely to receive an IV during their ED visit. For statistical analysis, a t-test was used to compare mean survival times, and chi-squared test was used to compare complication rates.

Results: 300 USGPIVs and 552 TPIVs were analyzed during this time period. The mean age for the USGPIV arm was 12.1 years (*range* = 0.05 - 26.9 years, *SD* = 7.5 years) and for the TPIV arm was 8.36 years (*range* = 0.01 - 25.7 years, *SD* = 7.3 years). Longevity data was available for 160/208 (76.9%) USGPIV patients and 401/428 (93.7%) TPIV patients that were admitted with an IV. Survival times of USGPIVs (*mean* = 73 hours, *SD* = 68 hours) were significantly longer than TPIVs (*mean* = 38 hours, *SD* = 29.4 hours, $p < 0.0001$). Removal reason was available for 155/208 (74.5%) USGPIVs and 362/428 (84.6%) TPIVs in patients that were admitted with an IV. There was no statistically significant difference in complication rates between USGPIVs versus TPIVs (54/155=34.8% versus 115/362=31.8%, $p = 0.50$).

Conclusion: Our data suggests that USGPIVs are a viable option for children with difficult IV access. Survival times were longer for USGPIVs versus traditional IVs, and there was no significant difference in complication rates between USGPIVs and traditional IVs.

652 Standardized Prehospital Provider Training in Sonographic Detection of Pneumothorax is Feasible and Accurate: A Review of the Literature and Meta-Analysis

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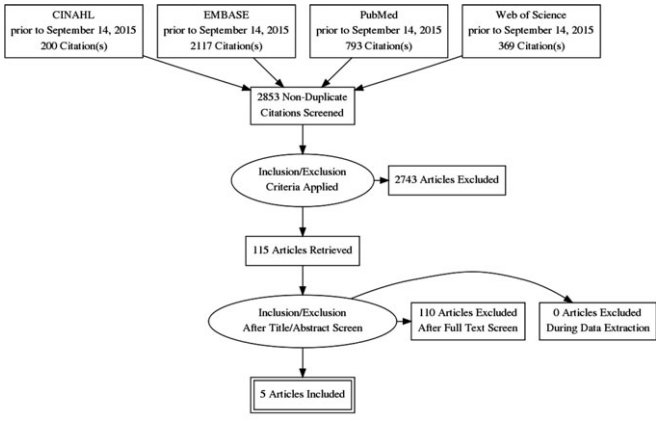
Background: Emergency ultrasound (EUS) had been shown to be a fast and accurate method for diagnosing pneumothorax (PTX) in the ED for emergency physicians, but performance metrics and training standards for pre hospital providers (PPs) remain unclear.

Objectives: Our goal was to determine the efficacy of standardized EUS training for PPs in detecting PTX after participating in structured EUS training.

Methods: We performed a systematic literature review using CINAHL, EMBASE, PubMed and Web of Science for articles pertaining to EUS training of PPs for PTX through September 2015 (Table 1). Studies excluded based on study population and relevance (Figure 1). Two independent reviewers screened abstracts. All identified references meeting inclusion criteria were then evaluated using the Quality Assessment of Diagnostic Accuracy Studies Statement (QUADAS). A meta-analysis was performed to determine the pooled accuracy for the detection of PTX by PPs after standardized EUS training.

Results: The initial systematic literature search yielded a total of 2853 unique abstracts. Of these, 115 were selected for full review after abstract screening. Five studies met our inclusion criteria, which evaluated the accuracy of PTX EUS of a total of 156 PPs. The pooled accuracy for the detection of PTX by prehospital sonographers post EUS training was 87% (95% CI= 66%-99%).

Conclusion: Pooled analysis showed that PPs with standardized EUS training in PTX developed a high degree of accuracy for the detection of PTX post training sessions. Our results are further supported by two recent pilot studies evaluating PPs EUS performance accuracy for PTX in the field (helicopter, EMS), after PPs had participated in standardized training sessions. These pilot studies showed accuracies of 91% and 94% for PPs to detect PTX with EUS prior to presenting to an ED. Further validation studies are needed to assess overall in-field accuracy of PPs EUS performance after



Author	Year	Country
Noble	2009	France
Lyon	2012	USA
Brooke	2012	UK
Chin	2013	USA
Bhat	2015	USA

Figure 652 – Welwarth

standardized training, however, our analysis shows that currently applied training methods seem efficient.

653 Delphi Method Validation of a Procedural Performance Checklist for Insertion of an Ultrasound-Guided Peripheral Intravenous Catheter

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Background: Peripheral intravenous (PIV) access is integral to hospital-based medical care for phlebotomy and medication administration. In patients with difficult venous access, physicians frequently rely on ultrasound-guided PIV (USGIV) placement, which can be a difficult skill to master. A validated checklist to access competency in USGIV placement is needed.

Objectives: To create a procedural performance checklist, developed by the Delphi method, for teaching providers to insert USGIV catheters.

Methods: A modified Delphi method was used to incorporate expert feedback for development of a USGIV catheter checklist. Our expert panel included 15 physicians, all with significant US procedural training and blinded to each other's identity. A preliminary 23-item checklist was created by the authors based on their experience teaching USGIVs and distributed to our expert panel. In two successive rounds, experts rated the importance of each checklist item on a 9-point Likert scale and provided optional comments. After each round, data was summarized in aggregate and reviewed by the authors, who were blinded to individual experts' responses. Items on the checklist were removed, added, and revised based on their median rating and any associated comments. It was decided a priori that any item with a median rating of 7 or greater (very important) would be automatically included in the next round, below 3 (least important) would be discarded, and between 3 and 6 (somewhat important) would be discussed. A third round was completed to approve the finalized checklist.

Results: We have completed two of three Delphi rounds. After the first round, checklist items had a median score range of 5-9, 3 items were combined, 1 item was discarded, and the remaining had wording changes. In the second round, the median range was 5-9, 10 items had wording changes, and 1 item was discarded. The Cronbach's α coefficient for the second round was 0.90. After the first two rounds, a 16-item checklist was created for approval in the third Delphi round (currently 53% reporting).

Conclusion: Using the modified Delphi method, our expert panel developed a procedural checklist for USGIV placement. This checklist requires further validation but may facilitate standardization of provider training in the placement of USGIVs and ultimately improve patient care.

654 Use of Point-of-Care Ultrasound in Non-Academic Emergency Departments

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Background: Point-of-care ultrasound (POCUS) has been defined as an integral component to the practice of emergency medicine. The use of POCUS has greatly expanded in the recent years. However there is utilization gap between academic and non-academic ED settings.

Objectives: To determine the current use of POCUS in non-academic EDs throughout the state of Arizona.

Methods: Cross-sectional study. An online questionnaire on the use of POCUS in the ED was electronically sent to all of the medical directors or ultrasound directors of each non-academic ED in Arizona. The survey consisted of questions regarding demographics, current practice patterns, policies, interdepartmental agreements, and perceptions regarding the use of POCUS. The responses were reported in terms of the percentage of total respondents along with confidence intervals.

Results: A total of 70 non-academic EDs were identified for inclusion in our study. To date, 28 EDs have completed the survey, representing a 40% response rate. All EDs have a dedicated ultrasound machine. Sevent- five percent (95% CI 56% - 94%) of EDs perform or interpret POCUS for patient care. The three most common applications of POCUS reported by respondents were FAST exam, cardiac ultrasound, and line placement. Sixty-five percent (95% CI 44% - 86%) of EDs perform less than 20 ultrasounds per week; and only 30% (95% CI 19% - 41%) bill for POCUS. Fifty-seven percent (95% CI 45% - 69%) have ultrasound privileges and only 28%(95% CI 18% - 39%) have a Quality Assurance program. No mechanism to archive images exist at 50% (95% CI 38% - 62%) of EDs. Fifty-five percent (95% CI 33% - 77%) of EDs have an ultrasound director or similar position filled, and 50% (95% CI 28% - 72%) of EDs indicated that they do not provide POCUS training. Only 40% (95% CI 19% - 61%) indicated that ultrasound experience is important in hiring decisions for ED physicians. A majority (79%, 95% CI 70% - 89%) favor ACEP clinical ultrasound accreditation program (CUAP).

Conclusion: Dedicated ultrasound equipment for POCUS use is available in all non-academic EDs in the state of Arizona. However, most EDs lack ultrasound training, credentialing quality assurance, and reimbursement components. ACEP CUAP may help overcome these barriers.

655 The Effect of Clinician-Patient Communication on Subsequent Posttraumatic Stress Symptoms in Patients Evaluated for Acute Coronary Syndrome in the ED

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Background: Evaluation for a potentially life-threatening cardiac event in the emergency department (ED) is a stressful experience that can result in symptoms of posttraumatic stress disorder, which are associated with increased risk of morbidity and mortality in patients. No study has tested whether good clinician-patient communication in the ED is associated with better psychological outcomes in these individuals and whether it can mitigate other risk factors for posttraumatic stress symptoms (PSS) such as perception of life threat and vulnerability in the ED.

Objectives: we examined the associations of threat perception and clinician-patient communication with subsequent PSS in a sample of patients being evaluated for an acute medical event (suspected ACS).

Methods: Data were analyzed from 474 participants in the REactions to Acute Care and Hospitalization (REACH) study, an observational cohort study of ED predictors of medical and psychological outcomes after evaluation for suspected ACS. Participants reported threat perceptions in the ED and provided information on clinician-patient communication using the Interpersonal Process of Care Survey. PSS were assessed using the Acute Stress Disorder Scale during follow-up.

Results: Good clinician-patient communication in the ED was associated with lower PSS (β=-0.11, p= .005), whereas increased threat perception was associated with higher PSS ((β =0.40, p<0.001). A significant interaction between clinician-patient communication and threat perception on PSS (β = -0.13, p=.037) suggested that patients with higher threat perception benefited most from good clinician-patient communication.

Conclusion: Good clinician-patient communication in the ED during evaluation for potentially life-threatening cardiac events may help offset risk for subsequent posttraumatic stress reactions. This benefit is particularly marked for patients who perceive the greatest degree of life threat and vulnerability during evaluation.

656 Inter-Rater Agreement of Nurse and Clinical Expert Tremor Assessments for Patients with Alcohol Withdrawal Syndrome in the Emergency Department

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Background: Of the domains assessed by the CIWA-Ar, tremor is the most objective, and reliable clinical symptom of alcohol withdrawal syndrome. Even so, anecdotal evidence suggests that the ability of health care workers to reliably rate tremor severity is highly variable, and there is no high quality, readily available training to teach this competency. Improper evaluation and interpretation of tremor may result in under or over treatment, posing serious risks to patient safety, prolonging emergency department (ED) length of stay, and increasing the likelihood of complications/hospital admission.

Objectives: To prospectively compare tremor assessment scores assigned by nurses and clinical experts for patients with alcohol withdrawal syndrome in the ED.

Methods: A prospective observational study was conducted for patients ≥18 years presenting to an academic ED in alcohol withdrawal from Oct 2014 to Aug 2015. Individual tremor assessments were videotaped by a research assistant and subsequently reviewed by 3 clinical experts, blinded to the primary clinical assessment. Tremor severity was scored using the 8-point CIWA scale (0=no tremor, 7=severe tremor). Tremor severity scores assigned in real-time by the nurses were compared to expert assessments of each video. Inter-rater agreement was estimated using Cohen's kappa (k) statistic.

Results: 31 patients with 62 tremor recordings were included. Nurse-derived tremor scores matched exactly with expert assessor scores in 11 (17.7%) cases, within 1 point for 29 (46.8%) cases and differed by ≥ 2 points in 33 (53.3%) cases. The overall kappa for agreement within 1 point for tremor severity was 'fair' 0.39 (95% CI: 0.25, 0.53).

Conclusion: These results confirm the high variability in the assessment of alcohol withdrawal tremor by health care workers. Future research should focus on ways to improve the accuracy of tremor in alcohol withdrawal patients, and the development and implementation of an educational program to improve the individual competencies of clinical staff in the recognition and treatment of alcohol withdrawal in the ED.

657 Access to Care and Depression Among Emergency Department Patients

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Background: The prevalence of depression among patients in the emergency department (ED) is significantly higher than in the general population, making the ED a potentially important forum for the identification of depression and intervention. Concomitant to the identification of depression is the issue of patient access to appropriate care.

Objectives: This study sought to establish prevalence estimates of potential barriers to care and relate these barriers with symptoms of depression.

Methods: Two medical students conducted brief surveys on all patients ≥ 18 years that presented to the ED and who demonstrated decisional capacity for consent. Following consent, the students conducted a brief survey on demographics, perceived access to care (scale from 1-5), and the PHQ-9 depression screener. If a participant reported severe depression (PHQ-9 > 20) and/or current thoughts of self-harm, these levels were immediately provided to the physician caring for the participant.

Results: A total of 637 participants were enrolled in the study. The percentage of participants with mild or greater depression was 42%, which is consistent with previous estimates in ED patients. The majority of patients reported experiencing some barriers to care (M=1.32, SD=0.42), with the most prominent being difficulty finding transportation (M=1.44, SD=1.02), work responsibilities (M=1.47, SD=0.99), and the feeling that the doctor is not responsive to their concerns (M=1.41, SD=0.93). Higher PHQ-9 scores were bivariately associated with higher access to care mean scores (r=0.44, p<0.001), suggesting that greater symptoms of depression are associated with greater difficulties accessing care. This association held when eliminating the least or most depressed individuals in the sample. Particularly strong associations were observed between PHQ-9 score and difficulty finding transportation (r=0.30), the feeling that the doctor is not responsive to patients' concerns (r=0.29), embarrassment about a potential illness (r=0.28) and confusion trying to schedule an appointment (r=0.29).

Conclusion: Across all barriers analyzed, there was a greater incidence of depression associated with a greater perception of barriers. These barriers may be used as potential targets for intervention to increase access to health care resources.

658 Prospective Validation of an iOS App to Evaluate Tremor in Patients with Alcohol Withdrawal Syndrome

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Background: Ideal management of alcohol withdrawal syndrome (AWS) incorporates a symptom driven approach, whereby patient symptoms are regularly assessed using a standardized scoring system (Clinical Institute Withdrawal Assessment for Alcohol-Revised; CIWA-Ar) and treated according to severity. Among the domains assessed by

the CIWA-Ar, tremor is the most objective indicator of withdrawal severity, however, the ability of clinicians to reliably quantify tremor is highly dependent on experience. We have previously described the development of an iOS based tool for tremor severity assessment.

Objectives: To prospectively validate an objective, reliable tool to standardize and quantify the severity of alcohol withdrawal tremor using the built-in accelerometer of an iOS application.

Methods: A prospective observational study of patients ≥18 years presenting to an academic emergency department in alcohol withdrawal was conducted from Oct 2014 to Aug 2015. Videotaped assessments were recorded on iOS devices, and subsequently reviewed by 3 clinical experts, blinded to the primary clinical assessment. Tremor severity was scored using the 8-point CIWA scale (0=no tremor, 7=severe tremor). Accelerometer derived results were compared to expert assessments of each video. Inter-rater agreement was estimated using Cohen's kappa (*k*) statistic.

Results: 76 patients with 78 tremor recordings were included. Accelerometer derived tremor scores matched exactly with expert assessor scores in 36 (46.2%) cases, were within 1 point for 73 (93.6%) cases and differed by ≥ 2 points in 5 (6.4%) cases. The overall kappa for agreement within 1 point for tremor severity was 'very good' 0.92 (95% CI: 0.86, 0.99).

Conclusion: iOS accelerometer based assessment of the tremor component of the CIWA-Ar score is reliable and has potential to more accurately assess the severity of patients in alcohol withdrawal. We anticipate this resource will be easily disseminated and will impact and improve the care of patients with alcohol withdrawal.

659 The Change in Stress Biomarkers with Changing Levels of Agitation in Patients with Agitation in the ED

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Background: Agitation is difficult to assess, and research is limited by the subjective nature of the measurements. Stress biomarkers and markers of acidosis have been associated with a patient's level of agitation, but it is not known if they are associated with changes in subjectively measured agitation levels.

Objectives: To determine the correlation between changes in agitation with stress biomarkers including serum dopamine, epinephrine, norepinephrine, pH, lactate, pCO2, heart rate and blood pressure.

Methods: This was a prospective observational study of patients in an urban Level 1 Trauma Center with 108,000 annual visits. Data collection was performed using trained research associates. We prospectively screened all patients in the ED for agitation during a randomized distribution of 440 8-hour shifts totaling 3,520 hours between 12/8/2012 and 8/10/2014. All patients were assessed using the AMS score, a previously validated 9-point scale ranging from unresponsive (-4) to normal (0) to severely agitated (+4). Patients with an AMS score >1 and with an IV in place were enrolled. Patients has their AMS score, vital signs, and had blood drawn at baseline and every 30 minutes until discharge. Blood was tested for serum catecholamines, lactate, pCO2 and pH. The AMS score was compared to stress biomarkers using linear regression. The effects of changing AMS on changes in biomarkers was assessed using Wilcoxon sign rank test for repeated measures.

Results: 43,838 patients were screened, 1266 were agitated, and of these 157 had an IV placed and were included (median presenting AMS 2, range 2-4). Data is included in table 1. Linear regression of the serum biomarkers and the AMS score demonstrated a significant correlation between pH (coef. 6.31, 95% CI 2.38-10.23, p<0.002) and dopamine (coef 0.2, 95% CI 0-0.4, p=0.05) with AMS. Other biomarkers had insignificant correlations. Changes is AMS scores were associated with changes in dopamine, epinephrine, norepinephrine and pH.

Conclusion: AMS scores was correlated with pH and dopamine. These markers may prove useful as objective measures of a patient's changing agitation level.

660 A Systematic Review of the Relationship Between Physician Implicit (Unconscious) Racial Bias and Clinical Decision Making

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Background: Prior studies have found conflicting results about whether physician implicit (unconscious) racial bias is associated with clinical decision making.

Objectives: The objective of this systematic review was to examine the evidence on the association between physician implicit racial bias and clinical decision making.

Methods: A librarian conducted a literature search of PUBMED, CINAHL, SCOPUS, and PsycINFO databases using a pre-determined protocol. Eligible studies were those that: 1) Included physicians or medical students; 2) Included a quantitative measure of implicit bias; 3) Included an assessment of physician clinical decision making; and 4) Were published in peer reviewed journals and written in English between 1995 and 2015. Two independent reviewers identified studies for inclusion, and disagreements were resolved by a third reviewer.

Results: Of the 1007 unique articles identified in the search, 25 were selected for full text review. Inter-rater agreement was 91%. Seven studies (n = 1253) met inclusion criteria. Six studies involved physicians (attendings, residents, and fellows) and 1 study involved medical students. All 7 studies used the Implicit Association Test to assess physician racial bias and clinical vignettes to examine physician decision making. An implicit preference favoring whites was common across all studies, although pediatricians demonstrated a weaker implicit bias. Five of the 7 studies found no evidence of a relationship between implicit bias and physician decision making. One study found that an implicit preference for whites was significantly associated with treating whites and not treating blacks with thrombolysis for myocardial infarction. One study found evidence of bias in 1 of 4 vignettes; implicit preference for whites was associated with not prescribing narcotic medication for postsurgical pain.

Stress Biomarkers by AMS Level

AMS score	Dopamine (IQR, Range)	Epinephrine (IQR, Range)	Norepinephrine (IQR, Range)	pH (IQR, Range)	pCO2 (IQR, Range)	Lactic acid (IQR, Range)
-4	93 (39-244, 20-2016)	95 (55-158, 19-1746)	1029 (719-2087, 46-10000)	7.31 (7.28-7.34, 7.08-7.48)	47 (40-51, 30-61)	2.95 (2.1-4.6, .5-20)
-3	70 (39-169, 20-1489)	28 (16-319, 10-7875)	747 (379-2215, 182-10168)	7.3 (7.23-7.33, 7.12-7.38)	51 (45-56, 33-75)	2.3 (1.4-3.5, .6-17)
-2	39 (20-98, 20-288)	37 (17-68, 10-471)	650 (309-1138, 46-3220)	7.33 (7.3-7.36, 7.18-7.68)	47 (45-52, 13-74)	1.8 (1.3-2.5, .7-8)
-1	37 (20-90, 20-1009)	29 (15-72, 10-1852)	629 (342-1123, 75-8772)	7.32 (7.29-7.35, 7.18-7.46)	47 (44-51, 30-68)	2.3 (1.2-3, .5-6.9)
0	37.5 (20-92, 20-1255)	53 (22-132, 10-1226)	663 (366-1198, 66-7909)	7.34 (7.32-7.38, 7.1-7.48)	46 (42-49, 25-69)	1.8 (1.2-2.7, .5-10.6)
1	43 (24-103, 20-1409)	73 (25-163, 10-1499)	798 (468-1507, 174-4469)	7.35 (7.35-7.39, 7.13-7.5)	43 (39-47, 20-55)	2.3 (1.4-3.4, .8-15)
2	53 (28-169, 20-1222)	71 (44-145, 10-649)	929 (577-1761, 310-9775)	7.34 (7.26-7.36, 7.23-7.45)	47 (35-48, 30-52)	2.3 (1.6-4.3, 1.1-8.4)
3	40 (20-59, 20-141	42 (24-118, 10-1951)	621 (510-1392, 38-2000)	7.37 (7.33-7.4. 7.29-7.49)	48 (35-48, 30-52)	2.2 (1.7-3.3, 1.3-4.3)
4	67	292	1514	7.22	58	8

Table 659: Miner.

Conclusion: The bulk of the evidence indicates that although many physicians demonstrate an implicit preference for whites, this bias does not appear to impact their clinical decision making. However, no study to date has examined the relationship between real-life patient encounters and physician bias. Until then, there is no conclusive evidence that implicit bias does not impact "real-life" physician decision making.

661 Association of Individual Characteristics and Collective Efficacy with Willingness to Perform CPR in Chicago

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Background: Bystander cardiopulmonary resuscitation (CPR) is a vital early component in the chain of survival for out-of-hospital cardiac arrest (OHCA). Very little in known about collective efficacy, which is defined as social connection to their neighbors and willingness to intervene for a common good, and the correlation to bystander CPR.

Objectives: The purpose of this study was to determine if there are significant associations between willingness to perform CPR, individual characteristics, and perceived collective efficacy.

Methods: This was a secondary data analysis of the University of Illinois Survey on Neighborhood Health (UNISON), a needs assessment of 24 Chicago community areas. The survey was conducted between November 2013 and May 2014 at participants' homes. Willingness to perform CPR was determined when the respondents answered yes to the question "Right now, if a friend or family member collapsed, would you provide CPR?" This question was correlated to other variables of interest (listed in table 1) by t-test or chi-square analysis.

Results: 454 community members were interviewed.341 (75%) reported yes to the willingness to perform CPR and 105 (23%) answered no. Those willing to perform CPR tended to be younger than those not willing to provide CPR (40.1 vs 48.4 year, p=.0001)), and women tended to be less willing than men (72.0% vs 82.7%, p=.009).Of all races, Black participants (83.7%) were more willing to provide CPR and Hispanics (63.3%) were least willing. Participant perception of collective efficacy was also significantly associated to CPR willingness. As the sense of collective efficacy increased, there was more willingness to perform CPR. Household income, White and Asian races, were not statistically significant for CPR willingness.

Characteristics	Perform CPR YES	Perform CPR NO	p-value
Age, mean (SD)	40.1 (15.5)	48.4 (19.2)	.0001
Gender			.009
Male	82.7%	17.3%	
Female	72.0%	28.0%	
White	71.8%	28.2%	.116
Black	83.7%	16.3%	.000
Asian	66.7%	33.3%	.279
Hispanic	63.3%	36.7%	.001
Household income (n)			
Low ($15k or less) (155)	74.1%	25.9%	0.585
Med ($15,001-50k) (145)	77.9%	22.1%	
High ($50,001+) (120)	79.2%	20.8%	
Collective efficacy			
"People around here are willing to help their neighbors"			
A great deal	86.7%	13.3%	.007
A lot	83.6%	16.4%	
A moderate Amount	66.2%	33.8%	
A little	80.8%	149.2%	
Not at all	75.9%	24.1%	
Collective efficacy			
"Overall, how much impact do you think people like you can have in making your community a better place to live?"			
No Impact at all	61.1%	38.9%	.018
A small impact	74.0%	26.0%	
A moderate impact	73.2%	26.8%	
A big impact	85.5%	14.5%	

Table 661: Kotini-Shah.

Conclusion: Our data suggests age and gender play a role in CPR willingness. In addition, Black and Hispanic community members are willing to perform CPR, despite known low bystander rates in minority populations. Furthermore, because perception of collective efficacy was associated with willingness to perform CPR, future CPR interventions should also incorporate elements that enhance social cohesiveness among neighbors.

662 Is There a Disparity in Discharge Narcotic Prescriptions From the Emergency Department?

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Background: Disparities in pain management in the emergency department (ED) have been widely studied showing that minorities and females tend to receive less analgesic treatment in the same case scenarios, but few studies examine pain medications given upon discharge. While emergency physicians should attempt to limit opioid prescriptions upon discharge, attention should be paid that all patients are being treated equitably and have adequate pain management.

Objectives: To provide a descriptive analysis of opioid prescriptions from the ED and how they differ by race and gender.

Methods: This was a retrospective study of a convenience sample of patients who were discharged from the ED at an urban safety-net tertiary medical center and received narcotic prescriptions medications upon discharge in 2014. Patients were stratified by race, gender, whether they were given narcotic pain medications in the ED, and the number and type of narcotic prescriptions received.

Results: We had a total of 2052 patients that met the inclusion criteria of which 1848 identified as black and 204 identified as nonblacks. The most common narcotic pain medication prescribed for all populations was 5mg hydrocodone/acetaminophen with black patients receiving an average of 18.20 tablets and nonblack patients receiving an average of 20.24 tablets. Females and males were prescribed an average of 18.28 and 18.52 respectively. 78.6% of black patients (79.8% female and 77.3% male) who received narcotic prescriptions upon discharge were treated in the ED with narcotics of which 46.5% was given in the intravenous form. 79.4% of nonblack patients (84.4% female and 74.2% male) received treatment with narcotics in the ED of which 67.9% was given in the intravenous form.

Conclusion: This pilot study quantifies the number of narcotic pain medications given to patients upon discharge as stratified by race and gender. Nonblack males were more likely to receive a larger quantity of the most commonly prescribed pain medication upon discharge. Most patients who received narcotic pain medications upon discharge also received narcotic treatment in the ED, however, black patients were more likely to receive an oral form of treatment as opposed to the intravenous form. Further studies are needed to examine whether other factors, such as, comorbidities, or previous drug use play a role in the amount of narcotic medications prescribed.

663 EMS Dispatches During Hurricanes Sandy and Irene

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Background: Hurricanes Irene and Sandy heavily impacted New Jersey. Investigating EMS dispatch trends during these storms may allow us to better prepare for future natural disasters.

Objectives: Our objectives to characterize the types of EMS dispatches immediately before, during, and after landfall compared to a control period.

Methods: This retrospective study was conducted at a large county based EMS dispatch center that provides first responders, Basic Life Support (BLS), Advanced Life Support (ALS), and critical care transport services to an area covering three counties with approximately 20 receiving hospitals including a Level I Trauma Center. At peak staffing, there are approximately 8-10 ALS vehicles, 25 BLS vehicles and 3 critical care vehicles deployed. We included of the day of landfall and seven days before and after. We compared dispatch data to a control period in 2010 that mirrored Hurricane Sandy the dates of. Descriptive statistics and two way ANOVA were used to assess dispatch, gender and age differences.

Results: We found Hurricane Sandy dispatches peaked 2 days after landfall (see Figure 1). Both ALS and BLS had an increase in usage in the post-Sandy period compared to the pre-Sandy (ALS 58.5 to 64.2, p = 0.005, ANOVA p=0.078; BLS 47.4 to 56.3, p<0.001, ANOVA p=0.001). There were 17 "hurricane related" (loss of power related issues, oxygen supply depleted, evacuation) and 15 carbon monoxide dispatches in the post-Sandy period and none in the others, including peri-Irene. The average age of cardiac arrest dispatches was lower in the post-Irene group compared to pre-Irene (74.3 to 47.8, p=0.023). There were no critical care requests before or after Hurricane Sandy, but there were 14 around Hurricane Irene and 10 surrounding the control period. Select results regarding patient age, gender and number of dispatches can be seen in Table 1.

Conclusion: Dispatch data can inform natural disaster planning. Education efforts can focus on geriatric patients, as well as resource distribution planning for an increase in geriatric populations. However, pattern variability between storms shows further study is needed to clarify exactly which resources should be utilized in order to maintain an ideal response to a natural disaster.

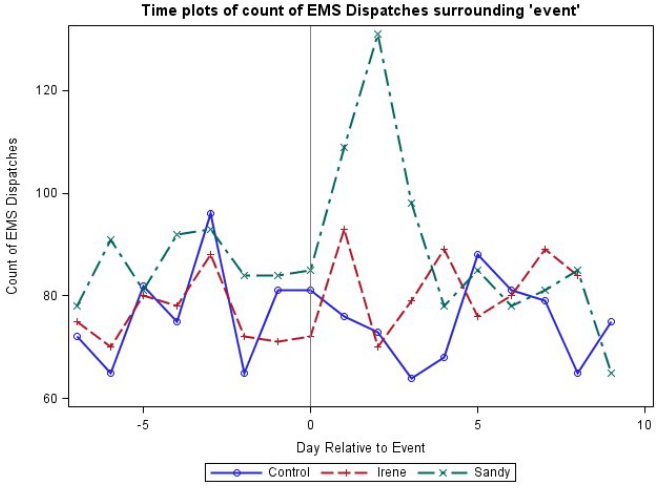

Figure 663 – Bucher

Table 1. Selected Results

	Event:	Control	Irene	Sandy	Does Event Modify Effect of Period?** p-value
Outcome	**Period**				
Daily Count	Pre	76.6 (10.9)	76.3 (6.3)	86.1 (5.9)	p=.68
	Post	75.0 (7.7)	81.3 (8.0)	89.5 (18.8)	
		*p=.73	p=.19	p=.66	
Daily Average Age	Pre	52.5 (4.2)	54.7 (2.0)	51.3 (2.3)	p=.0007
	Post	53.1 (3.6)	54.2 (3.6)	59.1 (2.2)	
		p=.75	p=.74	p=<.0001	
Daily Proportion Males	Pre	0.49 (0.06)	0.49 (0.05)	0.51 (1.16)	p=.37
	Post	0.49 (0.06)	0.47 (0.05)	0.46 (0.04)	
		p=.98	p=.33	p=.043	
Unit Staffing Level - BLS					
	Event:	**Control**	**Irene**	**Sandy**	**Does Event Modify Effect of Period?** p-value**
Outcome	**Period**				
Daily Count	Pre	44.3 (6.8)	45.7 (5.2)	47.6 (6.2)	p=.71
	Post	42.4 (6.4)	44.6 (16.5)	51.2 (11.6)	
		*p=.57	p=.87	p=.46	
Daily Average Age	Pre	49.3 (5.1)	52.6 (1.3)	47.4 (3.4)	p=.001
	Post	51.1 (5.1)	51.1 (4.3)	56.3 (2.5)	
		p=.49	p=.41	p<.0001	
Daily Proportion Males	Pre	0.47 (0.09)	0.48 (0.07)	0.51 (0.06)	p=.16
	Post	0.49 (0.08)	0.45 (0.08)	0.44 (0.06)	
		p=.55	p=.36	p=.027	
Unit Staffing Level - ALS					
	Event:	**Control**	**Irene**	**Sandy**	**Does Event Modify Effect of Period?** p-value**
Outcome	**Period**				
Daily Count	Pre	31.9 (5.1)	29.3 (4.3)	34.7 (5.2)	p=.91
	Post	31.9 (5.9)	27.9 (11.2)	35.5 (8.4)	
		*p=.99	p=.76	p=.83	
Daily Average Age	Pre	56.8 (3.9)	57.5 (4.2)	58.5 (2.6)	p=.078
	Post	55.9 (4.5)	58.6 (5.0)	64.2 (3.9)	
		p=.66	p=.64	p=.005	
Daily Proportion Males	Pre	0.52 (0.11)	0.51 (0.08)	0.52 (0.13)	p=.99
	Post	0.49 (0.11)	0.48 (0.12)	0.49 (0.09)	
		p=.55	p=.54	p=.57	

* P-values are derived from F-tests comparing pre- to post-event days from ANOVAs stratified by event.
** P-values are derived from F-test of an two-way ANOVA such that the interaction between period and event is tested to determine whether event modifies the change in outcome from pre- to post-event.

Table 663: Bucher.

664 National Assessment of Clinical Quality Programs in EMS

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Background: National guidelines recommend clinical oversight and continuous quality improvement (CQI) of all Emergency Medical Services (EMS). However, in practice, there is wide variability in program implementation across the United States due to differences in system design, level of resources and medical direction. With increasing focus on value and quality in health care nationally, there is a need to understand the current level of clinical quality programs for EMS.

Objectives: To describe the state of clinical quality programs in EMS and establish a baseline data set to understand the impact of future efforts to improve these programs.

Methods: A 46 question survey was developed by the National Association of EMS Physicians Quality Improvement committee. This survey was distributed through an online survey distribution tool (Survey Monkey®) to EMS agencies in the United States via national EMS agency list serves. Respondents were enrolled between August and November, 2015.

Results: 1186 complete or near-complete responses were received from EMS agencies from 47 states representing over 6.8 million (18.5% of estimated total) EMS 9-1-1 responses annually. Of those agencies completing the survey, 55.7% responded to 1000 or more calls/year in 2014. 47% have a medical director <5 hours/month and 67% do not participate in any national/external CQI program. For those that track QI metrics, the most common are; prehospital stroke scale (64.2%) and stroke last known well interval (59.0%), aspirin use (63.9%) and ECG (62.3%) in chest pain, and trauma scene time < 10 minute (58.9%). Common barriers to successful CQI programs include CQI training/ resources, time availability and provider buy-in.

Conclusion: This is new agency-level data that provides an in-depth look at clinical CQI and provides a baseline of current practice in EMS agencies in the U.S. In this broad sample of EMS agency respondents, there is inequality of resources and clinical oversight. Our findings demonstrate a need to address barriers to clinical quality programs in EMS.

665 A Novel Cooling Method and Comparison of Active Rewarming of Mild Hypothermia

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Background: No current technique has been established to effectively rewarm hypothermic victims in the pre-hospital environment, and testing comparative treatments with established cooling models are suboptimal.

Objectives: To compare the effectiveness of arteriovenous anastomosis (AVA) versus heated intravenous fluid (IVF) rewarming in mildly hypothermic subjects. Additionally, we sought to develop a novel method of inducing mild hypothermia.

Methods: Eight subjects underwent 3 cooling trials each to a mean core temperature of < 35°C by 14°C water immersion for 30 minutes, followed by walking on a treadmill for 5 minutes for convective "afterdrop" cooling. Core temperatures changes (Δtes) and rates of cooling (°C/hr) were measured by continuous esophageal measurements. Participants were then rewarmed by 1) control: shivering in a sleeping bag; 2) IVF: shivering in sleeping bag and infusion of 2 liter normal saline warmed to 42°C at 77 mL/min; 3) AVA: shivering in sleeping bag and circulation of 45°C warmed fluid through neoprene pads affixed to the palms and soles of the feet.

Results: Cold water immersion resulted in 0.5°C +/- 0.5 Δtes and 1°C +/- 0.3 Δtes with afterdrop (P<0.01); with an immersion cooling rate of 0.9°C/hr +/- 0.8 versus 12.6°C/hr +/- 3.2 with afterdrop (P<0.001). After cooling, core temperatures reached a nadir of 35.0°C +/- 0.5°C. There were no significant differences in rewarming rates between the 3 conditions (shivering: 1.3°C/hr +/- 0.7, R^2 = 0.683; IVF 1.3°C/hr +/- 0.7, R^2 = 0.863; and AVA 1.4°C/hr +/- 0.6, R^2 = 0.853; p = 0.58). Mean shivering inhibition was greater with AVA, but not significantly different (p=0.07).

Conclusion: This study developed a novel and efficient model of hypothermia induction in humans through exercise-induced convective afterdrop. Although there was not a clear benefit in either of the two active rewarming methods, AVA rewarming showed a trend towards greater shivering inhibition, which may be optimized by an improved interface.

666 Assessing the Validity of Prehospital Identification of Severe Sepsis Using Two Decision Aids

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Background: Sepsis is a complicated disease with no standard method for prehospital providers to consistently identify its presence. Evidence suggests that early accurate identification of patients with severe sepsis may reduce clinical deterioration.

Objectives: Assess the sensitivity and specificity of two prehospital decision aids in identifying patients with an ED diagnosis of sepsis among a cohort of patients identified as potentially septic by paramedic clinical judgment.

Methods: Patients originated from a municipal EMS agency transported to a level 1 trauma center from 12/14 to 7/15. Prehospital data were abstracted from the electronic patient care report with ED diagnosis abstracted from hospital records. 47 paramedics were trained to identify severe sepsis and were provided with one of two decision aids, the National Early Warning Score (NEWS) or Robson screening tool. They were instructed to indicate, using their clinical judgment, the presence of suspected severe sepsis. Patients with a paramedic impression of severe sepsis were retrospectively scored as NEWS or Robson positive or negative based on documented vital signs and classified as septic based on ED discharge diagnosis. Test characteristics were calculated for each decision aid.

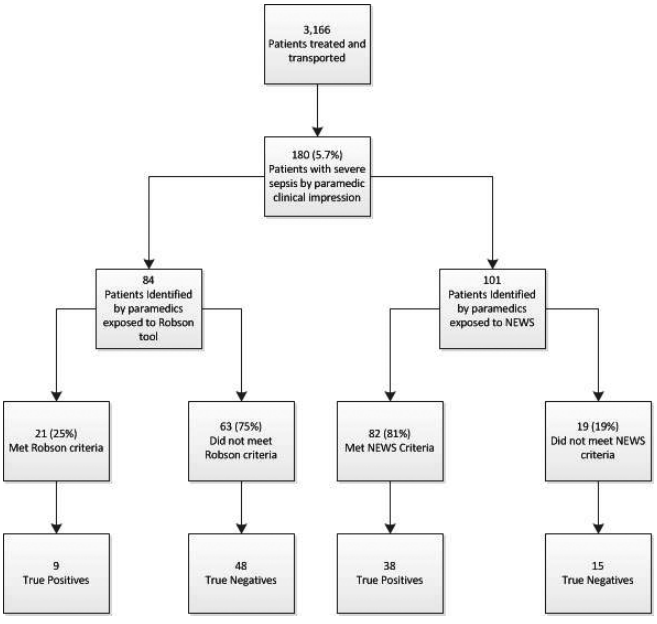

Figure 666 – Infinger

Results: Paramedics transported 3166 patients during enrollment Infinger figure 1 shows the distribution of patients by paramedic clinical impression and decision aid. The sensitivity of the NEWS was 0.90 (95% CI 0.76-0.97) compared to the Robson 0.45 (95%CI 0.24-0.68). While the specificity of the NEWS was 0.25 (95%CI 0.15-0.39) compared to the Robson 0.81 (95%CI 0.69-0.90).

Conclusion: When validated among a cohort of patients in which paramedics are likely to apply a decision aid, test statistics showed that these decision aids did not perform as well as previous retrospective validation studies. Like the disease process itself, decision aids for prehospital identification of sepsis are complicated and likely not performed comprehensively in the prehospital environment. The decision aids were also not integrated into the ePCR and paper based calculations were required. In order to reliably determine severe sepsis in the prehospital setting the elements of training, simple decision aids and integration into ePCR are needed.

667 Pre-Hospital Pediatric Care in a Large Urban American City: The FDNY Experience

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Background: Utilization of emergency medical services (EMS) varies by region and socioeconomic strata and has broad public health implications. Limited data exists describing EMS utilization in the pediatric population, particularly in an urban environment

Objectives: The goal of our study is to characterize EMS usage by the pediatric population in a large metropolitan area by evaluating the types of medical complaints and injuries documented by pre-hospital providers

Methods: We retrospectively reviewed FDNY data from the years 2006-2012 identifying children aged 0-18 years for whom 911 was contacted and FDNYEMS responded. The presenting problems as documented by pre-hospital providers were recorded and chief complaints were stratified into a limited number of medical and injury categories for analysis

Results: There were 4.8 million patient encounters in the study period, of which 534,403, or 13% were pediatric patients. EMS responded to nearly 76,000 children per year. Fifty-four percent of patients were male and the mean age was 8.5 years, with 35% of children aged four years or younger. These pediatric encounters generated 717,797 discrete documented complaints, of which 498,887 were medical problems. Respiratory emergencies accounted for 20.4% of all medical problems. Relatively low acuity problems including fever, abdominal pain, headache, vomiting, sore throat and flu-like symptoms constituted 34.4%. Of note, psychiatric and behavioral complaints accounted for over 10% of all documented medical problems, while critical care cases (including cardiac and respiratory arrest) represented less than 1% of medical emergencies. Blunt trauma and motor vehicle accidents accounted for more than one-third of injuries and more than 12,000 children were struck by motor vehicles in the study period. Providers encountered 4,673 cases of suspected child abuse and 559 cases of suspected domestic violence

Conclusion: Pediatric EMS calls are common in a large urban area and may reflect prevalent community medical conditions and social problems. EMS was frequently utilized for medical problems that appear to be relatively low acuity. This data can potentially help to inform the community and prepare pre-hospital providers for the common as well as the most serious medical and traumatic emergencies

668 EP and Surgeon Knowledge of and Training in eFAST at a Level I Trauma Center

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Background: Background Ultrasound imaging is used in a broad variety of diagnostic applications including trauma. eFAST for trauma examination has been proved accurate for diagnosing trauma when performed by nonradiologist physicians. In an era of cost-consciousness, there is evidence showing that using eFAST as a screening tool may help reduce testing, hospital stays and intensive care unit length-of-stay (LOS). eFAST may be performed simultaneously with other resuscitative measures, providing vital information in real-time. However, there is lack of recent literature regarding the degree of physician satisfaction with eFAST.

Objectives: Objective: To evaluate the knowledge and training of EPs and Surgeons regarding eFAST in trauma patients.

Methods: Methods We administered an anonymous survey to residents and attending physicians at a Level I trauma center regarding their knowledge of and training in eFAST. The survey included questions on demographics, prior medical training and bedside ultrasound experience, and perception of the accuracy of eFAST in the trauma patient. Data analysis was performed using STATA (version 13, College Station, TX). We used descriptive statistics. Adjusted and unadjusted logistic regression models will also be used. We be reported odds ratios (OR) with 95% confidence intervals (95%CI). We set the level of significance at 0.05.

Results: Results: 54 subjects were responded. 26 respondents form Surgery and 28 from EM. 38 (70%) were male; median age was 31 (IQR 29, 35). EM had 29 participants (54%); of these 6 (11%) were attendings, 1 (2%) was a Fellow and 22 (41% were EM residents. Surgery had 29 (46%); of these 2 (3%) were attendings, 18 (33%) were residents and 5 (9%) were associate providers (APs). Among all participants, 45 (85%) could actually explain how eFAST was different from Fast. The major difference in our sample was in whether the respondents had training in eFAST during residency, especially in EM as compared with Surgery. 15 (56%) of EM respondents had eFAST training as compared with 2 (8%) of Surgery respondents, $P<0.001$.

Conclusion: Conclusion While a sample of EM and Surgery residents, fellows attendings and APs on the knowledge of eFAST, Surgery may need more opportunities to receive formal training in this important modality.

669 EMS Cardiac Resuscitation In-Situ Simulation Did Not Improve Real World Rate of Return of Spontaneous Circulation

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Background: Prehospital return of spontaneous circulation (ROSC) of victims of sudden cardiac arrest is the crucial link to survival. Without ROSC in the field, survival to hospital discharge with intact neurological function is negligible. Minimally Interrupted CPR and Early Defibrillation are two prehospital interventions that have been shown to improve outcomes.

Objectives: The purpose of this study was to demonstrate the effectiveness of in-situ simulation training on the following surrogate outcomes: time to CPR initiation, time to first defibrillation, time of Peri-Shock Pause, total time of continuous CPR, and time of adequate CPR with the overall goal of improving real world ROSC rates.

Methods: This was a prospective educational intervention study. The total project was divided into three discrete stages: 1) Baseline ROSC rate, 2) Educational Intervention, and 3) Post Intervention ROSC rate. ROSC rates were determined by review of annual QA data. The educational intervention consisted of in-situ simulation of EMS providers from a single agency with real time assessment of measured end-points in pre- and post- intervention scenarios.

Results: We found a statistically significant improvement in all of our measured simulation outcomes. Time to CPR initiation went from 47.9 sec (38.0-57.8) to 2.17 sec (17.6-25.8), $p = 0.0001$. Time to first defibrillation dropped from 201.2 sec (141.9-260.4) to 132 sec (98.8-166.4), $p = 0.035$. Mean peri-shock pause dropped from 26.1 sec (20.8-31.4) to 15.4 sec (1.2-17.5); $p = 0.0005$. Finally, total time of continuous CPR improved from 70.5% (66.1-74.8) to 81.8% (78.3-85.2), $p = 0.0007$. Real world ROSC rates pre-intervention were 17% with an N of 70 and ROSC rate post-intervention was 20%, $N = 65$; which was not statistically significant, $P = 0.6722$.

Conclusion: Educational intervention utilizing high fidelity mannequin simulation statistically improved all measured surrogates for cardiac arrest outcomes: time to CPR initiation, time to first defibrillation, mean peri-shock pause, and percentage of arrest time spent performing CPR. However, improvement in these surrogate markers did not translate to real world improvement in ROSC rates.

670 Without Informed Consent: How IRBs Assess Community Consultations

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Background: The Community VOICES Investigators have conducted a series of mixed methods studies of emergency research conducted with an exception from informed consent (EFIC). The EFIC regulations allow investigators to enroll subjects who, due to the nature of their illness or injury, are not able to give informed consent for the research study. EFIC study investigators are required to perform Community Consultations (CC) prior to commencement of such studies, but it is left to each individual Institutional Review Board (IRB) to determine specific procedures for evaluating the CC process. Little is known about how IRBs assess this process to determine whether the EFIC should be granted.

Objectives: To understand the mechanisms by which IRBs evaluate and use the results of CC procesess in the review and oversight of EFIC studies.

Preliminary Data Display		
Domain of CC Assessment	Summary of Responses	Interviewee quotes
General Observations	In the EFIC studies reviewed, the IRB had longstanding relationships with experienced investigators. CC plans are reviewed for approval prior to implementation and the results of CCs are reviewed prior to study approval. IRB members rely on the broad federal guidelines for evaluation.	"The community consultation plan is compared to FDA regulations." R1 *"And we actually haven't had to be too prescriptive here because the groups that are doing this here at [Institution's name] know what they're doing."* R9
Feasibility	Using the broader, federal IRB guidelines and foundational principles, reviewers use gestalt to determine if EFIC study plans for CCs are achievable and practical.	"I read that and it sounds good to me." R5 *"They must also assess the ability to obtain community consultations. The choice is between broad studies or focus groups. It often depends on the population."* R4
Selection of Participants	IRB reviewers look for CCs that plan to include the target community; for example, if that community is a racial/ethnic minority, they expect to see community leader involvement. If the EFIC study is on a broader topic, like trauma, which can affect anyone, they expect the EFIC investigators to have a broad-ranging plan to appropriately recruit for the CCs. Reviewers do not have a minimum number of required CCs or CC participants.	"We trust our investigators; they know their populations better than we do." R6 *"We like to see a plan that offers the opportunity for multiple voices to speak and in multiple forms. So we look for a broad ranging kind of plan that will do its best to let people who are going to be impacted by the decision have a chance to voice their concerns."* R5
Quality of Communication	IRB reviewers largely rely on investigators' reports of the quality CCs, but there are no pre-determined criteria for such a report.	"[You get] a gut feeling for whether attendees understand the study." R4 "We got a summary report. . .that included both the specific attitudes with regard to the research involved and the general attitudes towards research. . .They use a heuristic analysis in their focus groups and we ask for a report of that." R5
Participant Response	IRB reviewers do not request a quantification of attitudes in the CC. There is no threshold for EFIC study objections that will halt a study's commencement or require alteration of its protocol.	"[We] rely on researchers to have a meaningful engagement process of the community." R5 *"It would be nice to have a rubric."* R9
IRB Observation in CC	IRB observation of CCs varies widely, with some reporting no direct observation by IRB reviewers and others reporting at least one reviewer being present at nearly all CCs.	*"In general the IRB is not part of the community consultation plan. We don't go out with the PI but we do expect a detailed report."* R6 "IRB members went as observers [to see] if there was clear communication between researchers and the community members." R2

Table 670: Chisolm-Straker.

Methods: Community VOICES 3 is an ongoing, mixed methods, observational study of emergency research conducted with an EFIC, at six centers that routinely conduct EFIC studies. Using semi-structured interviews of IRB members with EFIC experience, investigators examined IRB mechanisms for evaluation of and conclusions about EFIC studies' CC processes. IRB member responses are being analyzed using thematic analysis, including an *a priori* coding scheme for five domains previously developed by the VOICES team: Feasibility, Composition of Participants, Quality of Communication, Participant Response, Investigator/IRB Response.

Results: Sample IRB members' comments, organized by domain, are presented in Table 1. Thus far, none of the reviewers report that their IRBs have a predetermined threshold quantity of CCs that must be held or community members who must participate in said CCs before an EFIC study can proceed. Additionally, there is no threshold for how many objections must be raised to prevent commencement of a study or yield a change in the study's protocol.

Conclusion: Preliminary data indicate that individual IRBS have no predetermined methods of objectively evaluating CCs. IRBs express considerable trust in experienced EFIC researchers to conscientiously conduce Community Consultation. Some IRBs routinely attend CCs but most rely on reports provided by EFIC researchers summarizing the CC findings.