Association Between the Timing of Antibiotic Administration and Outcome in Patients With Septic Shock

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Background: Current guidelines recommend administration of antibiotics within one hour of recognition of severe sepsis.

Objectives: To determine the association between time to initial antibiotics and mortality in patients treated with an emergency department (ED) early sepsis resuscitation protocol.

Methods: Preplanned analysis of a multicenter ED-based randomized controlled trial of two early goal-directed resuscitation strategies that were shown to be non-inferior. Inclusion criteria: suspected infection, two or more systemic inflammatory response syndrome (SIRS) criteria, and either systolic blood pressure (SBP) <90 mmHg after a fluid bolus or lactate >4 mM. Patients were categorized in hourly time intervals for both time from triage and time from shock onset to antibiotic administration. The primary outcome was in-hospital mortality. Data analysis consisted of chi-square tests for odds ratios (OR) with 95% confidence intervals, and multivariable logistic regression (LR) to adjust for confounding.

Results: Out of 300 patients, 291 (97%) received an initial dose of antibiotics after presentation to the ED; 172/291 (59%) received the initial dose of antibiotics after shock onset. For all patients, delay in antibiotics had no effect on mortality at any time up to six hours after triage: 1 hour (OR 1.2, 95% CI 0.6–2.5), 2 hours (OR 0.71, 0.4–1.3), 3 hours (OR 0.59, 0.3–1.3). Delay in antibiotic administration until after shock onset as compared to before was associated with an increased likelihood of death (OR 2.4, 1.1–4.5); however, among patients who received antibiotics after shock onset, no difference in mortality was observed at hourly increments: 1 hour (OR 1.3, 0.6–2.7), 2 hours (1.1, 0.4–3.0), or 3 hours (0.9, 0.2–4.8). Results were the same after adjusting for confounding with LR.

Conclusion: In this large, prospective study of patients with severe sepsis, we found no increase in mortality with hourly delays in antibiotics after triage. Delay in antibiotics until after shock onset was associated with increased mortality, however, if antibiotics are administered after shock onset there was no increase in mortality with hourly delays.

The editors of Academic Emergency Medicine (AEM) are honored to present these abstracts accepted for presentation at the 2011 annual meeting of the Society for Academic Emergency Medicine (SAEM), June 1 to 5 in Boston, Massachusetts. These abstracts represent countless hours of labor, exciting intellectual discovery, and unending dedication by our specialty’s academicians. We are grateful for their consistent enthusiasm, and are privileged to publish these brief summaries of their research.

This year, SAEM received 1163 abstracts for consideration, and accepted 655. Each abstract was independently reviewed by up to six dedicated topic experts blinded to the identity of the authors. Final determinations for scientific presentation were made by the SAEM Program Scientific Subcommittee, chaired by Michael L. Hochberg, MD and the SAEM Program Committee, chaired by Andra Blomkalns, MD. Their decisions were based on the final review scores and the time and space available at the annual meeting for oral and poster presentations.

We present these abstracts as they were received, with minimal proofreading and copy editing. Any questions related to the content of the abstracts should be directed to the authors. Presentation numbers precede the abstract titles; these match the listings for the various oral and poster sessions at the annual meeting in Boston. Abstracts marked as late-breakers are prospective research projects that were still in the process of data collection at the time of the December abstract deadline, but were deemed by the Scientific Subcommittee to be of exceptional interest. These projects will be completed by the time of the annual meeting; data shown here may be preliminary or interim.

On behalf of the editors of AEM, the membership of SAEM, and the leadership of our specialty, we sincerely thank our research colleagues for these contributions, and their continuing efforts to expand our knowledge base and allow us to better treat our patients.

David C. Cone, MD
Editor-in-Chief
Academic Emergency Medicine
2 Triage Nurse Administered Oral Corticosteroids: An Effective Innovation in Children With Moderate to Severe Acute Asthma Exacerbations
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Background: Despite evidence of oral corticosteroid effectiveness for acute asthma exacerbations, delays in administration are concerning. This study assessed time spent in the emergency department (ED) and possibly inpatient admissions.

Objectives: To determine the effectiveness of triage nurse-administered oral corticosteroids in children presenting to the ED with a moderate to severe acute asthma exacerbation prior to physician assessment.

Methods: We developed and implemented a protocol permitting nurse administration of oral corticosteroid at triage to children presenting with moderate to severe asthma exacerbations. The validated Pediatric Respiratory Assessment Measure (PRAM) determined severity. During the initial four-month control period, patients received usual care: triage-initiated bronchodilator therapy per PRAM severity with steroids only given after physician assessment. During the intervention period, patients received triage nurse-administered steroids based on the PRAM score. A one-month period separated control and intervention periods for nurse training. The primary outcome was time between arrival and a clinically meaningful improvement (defined as a lasting reduction in return rates to ED or subsequent admission) or admission. Secondary outcomes included total time in the ED, admission rate, and return ED visits for asthma.

Results: Of 1183 cases of acute asthma that presented during the seven day period following the index visit, 273 patients enrolled, 74 TBI patients (53 mild, 21 moderate) and 199 controls (176 normal controls, 16 MVC controls, and 7 orthopedic controls). The mean age of TBIs was 39 years (range 18–89) with 61% males. There were 17 (22%) patients with a +CT. Mean serum GFAP levels were 0.038 (95% CI 0.029–0.047) in normal controls, 0.203 (0.482–0.357) in orthopedic controls, 0.204 (0.102–0.306) in MVC controls, 0.439 (0.293–0.506) in MTBI, and 1.961 (0.736–3.196) in moderate TBI (P<0.001). The AUC for distinguishing MTBI from all controls was 0.88 (95% CI 0.83–0.93) and for distinguishing MTBI from both controls was 0.89 (95% CI 0.83–0.94). Mean GFAP levels in patients with +CT versus those with +CT were 0.384 (0.262–0.507) and 2.382 (0.911–3.854), respectively (P<0.001), and the AUC was 0.81 (95% CI 0.65–0.94).

Conclusion: Serum GFAP was able to distinguish moderate from MTBI and to distinguish MTBI from normal, orthopedic, and MVC controls. In addition, serum GFAP levels were able to discriminate between +CT and -CT. These data suggest that GFAP is a potential biomarker for MTBI.

4 Hydroxocobalamin Versus Sodium Thiosulfate in the Treatment of Acute Cyanide Toxicity in a Validated Swine (Sus Scrofa) Model
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Background: Hydroxocobalamin (HOCOB) is a recently FDA-approved antidote for cyanide (CN) toxicity. Sodium thiosulfate (ST) has also been recommended in CN toxicity treatment because of few side effects, but its efficacy has not been clearly established. We have previously compared HOCOB+ST to sodium nitrite+ST in our swine model of CN toxicity. No study has directly compared HOCOB to ST in a severe CN toxicity model.

Objectives: To compare the return to baseline of mean arterial blood pressure (MAP) between three groups of swine with acute CN toxicity and treated with HOCOB, ST, or a combination of HOCOB+ST. We also followed CN, lactate, pH, and nitrotyrosine (nitric oxide marker) levels.
Methods: Thirty-six swine (48–52 kg) were intubated, anesthetized, and instrumented for continuous MAP and cardiac output (CO) monitoring. CN was continuously infused until severe hypotension (50% of baseline MAP). Animals were randomly assigned to HOCOB (150 mg/kg), ST (413 mg/kg), or HOCOB (150 mg/kg) + ST (413 mg/kg) and monitored for 60 min after start of antidotal infusion. A sample size of 12 animals per group was determined by group size analysis based on power of 80% to detect an effect size of 0.54 difference (approximately 1 sdev) of the MAP mean between the groups and an alpha of 0.05. RM ANCOVA was used to determine statistically significant changes between groups over time.

Results: Baseline mean weights (49, 49, 51 kg) were similar. Time to hypotension (25, 28, 33 min) and CN dose at hypotension (4.7, 5.0, 5.6 mg/kg) were also similar (p=0.10). At hypotension, mean CN blood (3.2, 3.7, 3.5 mcg/ml) and lactate levels (7, 8.2, 8.3 mmol/L) were similar (p=0.06). All 12 animals in the ST group died (p<0.001), as compared to 2/12 in the HOCOB/ST group and 1/12 in the HOCOB group. No statistically significant differences were detected between HOCOB groups for CO, MAP, CN levels or mortality at 60 min. Lactate (2.6 vs 2.1 mmol/L), pH (7.44 vs. 7.42), and bicarbonate (25 vs. 26 meq/L) at 60 min were also similar in the HOCOB groups (p>0.05). Serum nitrotyrosine rose during CN infusion in all animals and decreased after hypotension in the HOCOB groups (p=0.05).

Conclusion: Sodium thiosulfate did not reverse CN-induced shock in our swine model of severe CN toxicity. Sodium thiosulfate also failed to augment HOCOB efficacy on CN-induced shock. HOCOB alone was effective for severe CN toxicity.

5 Impact of England’s Four Hour Emergency Throughput Target on Quality of Care and Resource Use
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Background: In 2005, the Department of Health in England mandated that 98% of all emergency department (ED) patients must be seen, treated, and leave the department (for home or an inpatient bed) within four hours. It is unknown if limiting time for evaluation in the ED results in poorer quality of care or increased resource use.

Objectives: To determine the effect of the four-hour target quality of care and resource use.

Methods: This was a retrospective study. Fifteen purposively sampled EDs selected for their range of performance on the target provided administrative data on all ED visits in May and June for the years 2003–2006. Using a time-series design, we assessed the proportion of admissions, ED deaths, and return visits within one week, and frequency of laboratory and radiologic testing across study years. Clustering by hospital was adjusted for using generalized estimating equations. Secondary analysis was conducted on these outcomes for patients ≥65 years old.

Results: 772,525 visits were analyzed. Although total ED visits increased, the percentage of patients arriving by ambulance and the percentage of elderly ED patients remained stable across the study years. Between 2003 and 2006, the proportion of patients admitted was unchanged (21.6% and 21.5%, respectively). Return visits within one week stayed the same (33.3% in 2003, 31.1% in 2006); likelihood of being admitted after a return visit decreased from 27.6% to 22.9%. The proportion of patients receiving laboratory investigations rose from 9% to 15%. Radiological testing was unchanged (27% of all patients), although CT scanning of the elderly doubled from 0.68% of patients to 1.18%.

Conclusion: The four-hour target did not result in an increase in hospital admissions, deaths in the ED, or return visits, although the use of some resources increased. These data suggest that a time limit on ED stays does not lower the quality of care given in the ED, and does not create an undue burden on resource use.
enrolled. Exclusion criteria: any patient on chronic steroids or other immunomodulating drugs, colony stimulating factors, or undergoing active chemotherapy. Study interventions: controls had a single blood draw. Sepsis subjects (SS) had serum drawn at enrollment and at 12, 24, 48, and 72 hrs from ED presentation. A single physician investigator determined the SS’s clinical stage (SIRS, sepsis, severe sepsis, septic shock). HMGB1 levels were determined using purified recombinant HMGB1 at various dilutions by Western blot analysis. Levels of 42 other cytokines were determined in a subset of SS. Nonparametric tests were used. The difference in HMGB1 levels in controls and SS at baseline was analyzed using the Mann-Whitney test. The difference in HMGB1 levels among the sepsis groups was analyzed using the Wilcoxon Two-Sample Test.

Results: Thirty-seven SS and eight control subjects were enrolled. The median age of all subjects was 64 years, and 62% were male. At baseline there was a significant difference in HMGB1 levels between SS and healthy controls, with median levels of 1,370.0 ng/mL (IQR 270.0 - 5,600.0 ng/mL) and 37.0 ng/mL (IQR 17.5 - 66.0 ng/mL), respectively (p<0.0003), with median values of the SIRS/sepsis groups and severe sepsis/septic shock groups at 990.0 ng/mL (IQR 215.4 - 4,440.0 ng/mL) and 3,978.1 ng/mL (IQR 1,000.6 - 5,800.0 ng/mL), respectively. Forty-three percent of SS had HMGB1 levels that directly correlated with clinical progression and convalescence.

Conclusion: HMGB1 is present in high levels in ED sepsis patients and correlates well with known sepsis markers. This suggests that HMGB1 may be a potential biomarker for sepsis severity as well as a clinically viable therapeutic target for sepsis patients presenting to the ED due to its persistence in serum over time and correlation with convalescence.

8 Examining the Relationship Between the Use of Observation Status and the Likelihood of 1-day Stays in Patients With Circulatory Disease
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Background: One-day stays by patients admitted from the emergency department (ED) with circulatory disease place hospitals at high risk for non-payment. One strategy to avoid payment denial for a short inpatient stay is to place such patients in observation status. Given the benefit of additional time and resources for patient assessment, it is hypothesized that patients admitted to the hospital after observation should have more definitive admission indicators than those admitted directly from the ED, decreasing the likelihood of 1-day stays and subsequent payer denial.

Objectives: To examine the relationship between observation status and the likelihood of 1-day stays in circulatory disease patients.

Methods: Retrospective study in a major academic medical center of all adult patients seen in 2009 with circulatory disease whose admission resulted in a 1-day stay. All patients with a final inpatient diagnosis in the ICD-9 CM chapter “Diseases of the Circulatory System” were included. Admitted patients placed in observation were compared to those admitted directly from the ED.

Results: Of the 56,115 visits to the ED, 13,749 (25%) were ultimately admitted, of whom 2,946 (22%) were classified with circulatory disease. Circulatory disease patients had a significantly higher rate of 1-day stays than patients in other diagnostic categories (33% vs. 20%, p<0.001), but had similar rates (9% vs. 8%) of payer denial. Patients with circulatory disease spent an average 14.74 hours in observation status prior to hospital admission, resulting in an average ED length of stay of 21 hours, expectedly longer than those bypassing observation (11 hours). Circulatory disease patients placed in observation were equally as likely to go on to a 1-day inpatient stay as those admitted directly from the ED (37% vs. 33%). The likelihood of initial payer denials was similar in both groups (10% vs 9%). Total inpatient charges at risk for non-payment for both groups equaled $478,587.

Conclusion: In this institution, patients with circulatory disease had the highest rate of 1-day stays versus all other patients. There were no significant differences in rates of 1-day stays or payer denials for patients admitted directly from the ED versus those admitted after observation. The additional assessment time in the ED for admitted observation patients does not appear to affect the likelihood of payer denial for 1-day stays.

9 Induction of Mild Therapeutic Hypothermia Using Large Volume Ice Cold Saline Is Associated With Elevated Carotid Artery Flow and Cerebral Perfusion Pressure in a Post-arrest Porcine Model
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Background: Induction of mild therapeutic hypothermia (MTH) is a mainstay in post-arrest management. Cold saline infusion at 30 cc/kg is a common method for inducing MTH.

Objectives: To evaluate the physiologic changes associated with induction of MTH using large volume (>30 cc/kg) ice cold IV saline in a porcine model.

Methods: Five sedated, intubated, and ventilated swine were instrumented with central aortic (Ao), right atrial (RA), and cerebro-sagittal sinus (SSP) pressure-transducing catheters while under general anesthesia. Carotid arterial flow probes and esophageal temperature probes were placed. All measurements were digitized and continuously recorded to disk. Mean arterial pressure (MAP) and mean cerebral perfusion pressures (CePP) were calculated. The animals underwent either VF cardiac arrest (n=2) or hypoxic pulseless electrical activity (PEA) arrest (n=3). All animals were resuscitated using standard advanced cardiac life support (ACLS) guidelines but without using vasopressors. Once resuscitated, all animals had MTH induced using ice cold IV saline infusion to a goal temperature of 34°C as rapidly as possible. Volume of saline to achieve goal temperature was recorded. Hemodynamic parameters, MAP, and mean CePP were calculated over a one minute time period before initiating arrest and then after the goal temperature was achieved. Values were compared using paired t-tests.

Results: The average time to goal temperature was 15.5 ± 8.9 minutes, and the mean volume of cold saline infused was 76.3 ± 27.5 cc/kg. Mean CePP (31.9 mmHg vs. 31.1 mmHg; p=0.001), MAP (76.6 vs. 51.8 mmHg; p<0.001), and carotid artery flow (2234.3 vs. 1010.2 ml/min; p<0.001) were all significantly higher in animals after induction of MTH using large volumes of cold saline when compared to baseline values.

Conclusion: Induction of MTH using high volume cold saline is associated with elevated CePP and carotid artery flow. This may have clinical significance for post-arrest management.

10 Can Tile Prevent Scorpions From Crossing a Barrier? An Experimental Controlled Trial
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Background: The bark scorpion (Centruroides sculpturatus) is one of few scorpion species with venom capable of provoking a clinically significant response. With a range from the Southwestern United States to Northern Mexico, this species presents a small but real threat to people in the region. Young children are at higher risk for severe reactions, rarely even death. Most scorpion stings occur in the home; deterring entry reduces stings. Sug- gested ways to deter entry include pesticides, physical barriers, and trapping, but little scientific validation of such methods exists.

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Objectives: To test several methods to deter scorpion entry into homes. Our hypotheses were that tile would deter or prevent scorpions from crossing a barrier, and that tile type and construction method may alter effectiveness.

Methods: We used a forced-choice and no-choice experimental design with bark scorpions. We tested whether scorpions could cross various horizontal and vertical tile surfaces. The horizontal test arena was split in half, one side with sand (control surface) and the other with tile (granite or porcelain). Scorpions were placed at one end and exposed to light, causing them to move to seek shelter. Each experiment was repeated once with control/test surfaces switched. Vertical climbing was tested by comparing a carpet surface (control) to tile surface and with a no-choice test of tile surfaces with and without grout. The proportions of scorpions crossing each surface to shelter were analyzed using chi-square or Fisher’s exact test (alpha = 0.05).

Results: The proportion of scorpions crossing granite (65/100) was significantly greater (p=0.003) than sand (35/100). There was no difference between porcelain (56/100) or sand (44/100, p=0.23). In the vertical forced-choice test, 100/100 scorpions chose carpet (p<0.001) over continuous tile. In vertical no-choice trials, no scorpions crossed the plain tile surface (0/50); however, 17 of 50 scorpions were able to climb the vertical tile (p<0.001) with a 1 cm grout line added.

Conclusion: Horizontal tile barriers do not appear to deter scorpion passage. Vertical continuous tile appears to be a successful deterrent for scorpions. However, addition of grout reduces effectiveness of vertical tile barriers, making construction a key factor in deterring scorpion entry into homes.

11 The Epidermal Growth Factor Receptor Mediates Thymosin β4-enhanced Oligodendrogenesis After Stroke
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Background: The administration of thymosin beta 4 (Tβ4) (RegeneRx Biopharmaceuticals Inc, Rockville, MD) improves neurological outcome in a rat model of embolic stroke. Tβ4 treatment promoted differentiation of oligodendrocyte progenitor cells (OPCs) to mature myelin-secreting oligodendrocytes (OLs). However, the mechanisms underlying the differentiation of OPCs to OLs by Tβ4 are unclear.

Objectives: We tested the hypothesis that the epidermal growth factor receptor (EGF-R) mediates Tβ4-enhanced oligodendrogenesis.

Methods: We employed primary neural progenitor cells (NPCs) and a mouse OPC line (N20.1 cells) to investigate the molecular mechanisms of Tβ4-enhanced oligodendrogenesis. NPCs were isolated from the rat subventricular zone (SVZ) of lateral ventricles of two cultures containing 50 ng/ml of Tβ4 and a mouse OPC line (N20.1 cells) to investigate the molecular

12 The Efficacy of Oxygen Wafting Using Different Delivery Devices, Flow Rates, and Device Positioning
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Background: Oxygen delivery to pediatric patients in the emergency room can be a challenging task. Wafting provides a non-contact alternative that might be better tolerated by uncooperative children. Despite this being common practice, little research has been done on wafting techniques and no studies have evaluated its clinical effectiveness.

Objectives: The aim of this study was to identify the combination of oxygen delivery device, oxygen flow rate, and device positioning that produces the highest concentrations of oxygen at the mouth and nose of a simulated patient.

Methods: A simulated patient and oxygen sensor were used to compare six oxygen delivery devices (pediatric simple face mask, pediatric non-rebreather mask, adult simple face mask, adult non-rebreather mask, adult nebulizer, and simple oxygen tubing) in various positions in front of and below the simulated patient’s face, with oxygen flow rates ranging from 6 to 15 liters per minute (L/min).

Results: Only oxygen tubing and the pediatric non-rebreather mask consistently produced oxygen concentrations above 30%. At 15 L/min, oxygen tubing held in front of and aimed at the face produced oxygen concentrations ranging from 31.2% (at 15 cm) to 56.7% (at 5 cm); reducing the flow rate to 6–8 L/min had no meaningful effect on the measured oxygen concentrations. The pediatric non-rebreather mask held below the face produced oxygen concentrations ranging from 35.0% (at 10 cm) to 39.8% (at 5 cm). When tubing was used and held below the face, flow rates between 6–8 L/min produced somewhat higher concentrations than 15 L/min (at 5 cm: 36.3% vs. 30.9%).

Conclusion: When delivering oxygen by wafting, the highest oxygen concentrations (>50%) are achieved when positioning oxygen tubing 5–15 cm in front of and aimed at the face; oxygen concentrations between 30% and 40% can be achieved using either oxygen tubing or a pediatric non-rebreather mask positioned 5–10 cm below the face. When tubing is used, the flow rate of oxygen may be decreased to 6–8 L/min without reducing the oxygen concentrations. These findings should be considered by emergency department staff when administering oxygen via wafting to pediatric patients. They will also be incorporated into a future study using transcutaneous oxygen monitoring to test the clinical effectiveness of wafting with these devices.

13 The Effect of Intravenous Lipid Emulsions on Intravenous Phenytoin Toxicity
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Background: Phenytoin and its diluent, propylene glycol, are very lipid soluble and phenytoin is often given intravenously for rapid loading. Toxicity (hypotension, bradycardia, dysrhythmias, and death) can occur with rapid infusion rates and are due to both the sodium channel blocking effects of phenytoin and the propylene glycol. Intravenous lipid emulsions (ILEs) have been shown to improve survival in other lipid-soluble sodium channel blocking drugs, including bupivacaine and tricyclic antidepressants.

Objectives: We wished to determine the effect of ILEs in an animal model of intravenous phenytoin toxicity.
Methods: This was a controlled investigation using 20 rats. Each rat was anesthetized with ketamine and xylazine and instrumented with continuous blood pressure and heart rate monitors. Each rat was given a phenytoin infusion at a rate of 50 mg/kg over 5 minutes until the mean arterial pressure (MAP) decreased to 50% of baseline (phenytoin toxicity). The rats were randomized into two groups (n=10/group). On reaching phenytoin toxicity, they received either three boluses of 5 ml/kg of 20% ILE every 2.5 minutes and an infusion of 20% ILE at a rate of 1 ml/kg/min for 5 minutes, or an equivalent regimen with normal saline (NS). Animals were observed for a total of one hour. The primary endpoint was survival. Secondary endpoints were MAP and heart rate (HR). Data were analyzed with Kaplan-Meier time to event analysis and compared using the log rank test and post hoc testing (LSD). A pretest sample size calculation determined that 10 animals per group were needed to detect a 50% increase in survival time.

Results: The median survival time for the ILE group was 9.5 min (95% CI = 8.0–11.0) (p = 0.05). Two animals in the NS group and one animal in the ILE group survived the one hour observation period. At five minutes after phenytoin toxicity, the HR was higher in the NS group (190 BPM) compared to the ILE group (143 BPM) (mean difference 47 BPM, 95% CI 1.3–93.4). We did not detect a difference in HR and MAP at other times.

Conclusion: Intravenous lipid emulsion did not improve survival or hemodynamics in this model of intravenous phenytoin toxicity. During phenytoin toxicity, the NS group had an increased HR at 5 minutes and a non-significant trend to increased survival.

14 Prevalence of Levamisole in Urine Toxicology Screens Positive for Cocaine in an Inner-city Hospital Setting

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Background: Levamisole is a veterinary pharmaceutical used to treat worm infestations in livestock. Recently, drug cartels have started adding levamisole to cocaine. According to the DEA in 2009 approximately 73.2% of drug specimens contain levamisole. The reason for this addition is unclear, but likely because levamisole is a white powder, cheap, easily purchased and thought to increase the euphoric effects of cocaine. Unfortunately, levamisole can result in life-threatening agranulocytosis, leukopenic leucocytopenia, and cutaneous vasculitides. While levamisole is known to be present in cocaine specimens, it is not clear how often levamisole exposure from cocaine use leads to systemic levamisole absorption.

Objectives: The objective of this study was to determine the prevalence of levamisole in urine toxicology screens positive for cocaine in an inner-city hospital setting.

Methods: After IRB-approval, consecutive urine toxicology screens positive for cocaine by SYVA® EMIT 2 immunoassay were batched and sent for comprehensive drug (including levamisole) analysis using gas chromatography-mass spectroscopy (GC/MS). No patient identifying or demographic data were collected in this study. Proportions of samples (95% confidence intervals) positive for cocaine, levamisole, and other drugs of abuse were calculated.

Results: Two hundred and twelve samples were obtained and analyzed over eight months. Although all of the samples were positive for cocaine by immunoassay, only 171/212 (81%, 95% CI 75 to 85) were positive for cocaine by GC/MS. Of the samples positive for cocaine by GC/MS, 140/171 (82%, 95% CI 75 to 87%) were positive for levamisole. Of the samples negative for cocaine by GC/MS, 8/41 (20%, 95% CI 10 to 34%) were positive for levamisole. The overall proportion of samples positive for levamisole was 148/212 (70%, 95% CI 63 to 76%). The most common other drugs found in the specimens were opioids (methadone 34% of samples, codeine 14%, heroin 5%, morphine 4%, and oxycodone 4%).

Conclusion: This study demonstrates that levamisole used to adulterate cocaine is systemically absorbed by cocaine users and is common in urine samples positive for cocaine. The relatively high incidence of samples positive for cocaine by immunoassay but negative by GC/MS may be due to degradation of cocaine metabolites during storage. The high prevalence of methadone in these samples is likely from methadone maintenance clinics.

15 Ethanol and Carbon Dioxide Concentrations During Vodka Smoking: A Quantitative Analysis

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Background: Recent attempts have been made to find new means of ethanol (EtOH) absorption, including “smoking,” and the Alcohol Without Liquid (AWOL) machine. Smoking EtOH involves placing a quantity of dry ice into a vessel, then pouring ethanol over the dry ice and inhaling the vapors that are produced as the dry ice sublimates. The AWOL machine involves putting the EtOH of choice into a chamber that is connected to an air compressor. The air is pumped through the ethanol, which then vaporizes and is inhaled by the user. Proponents of both techniques claim more rapid onset of effects, fewer adverse reactions, and decreased caloric intake. To our knowledge, no one thus far has attempted to quantify the concentration of EtOH vapor and CO₂ produced by either of these techniques.

Objectives: To determine concentrations of EtOH and CO₂ generated using both smoking and AWOL techniques.

Methods: In order to simulate the experience of home users, we purchased a bottle of 100-proof (50% EtOH) vodka, 20 lbs of dry ice, and a travel mug. Four separate protocols using different amounts of EtOH were carried out under a standard laboratory hood. Investigators were not blinded. Concentrations were measured with the Miran SappHiRe gas analyzer.

Results: Mean concentrations of EtOH and CO₂ are summarized in Graph 1 and Table 1. In protocol 1, using 30 ml of EtOH and 25 g of CO₂, the highest mean EtOH concentration was 9632 ppm at 60 seconds after the start of the protocol. The lowest mean concentration of EtOH was 233 ppm at 600 seconds after the start of the protocol. The lowest mean concentration of EtOH was 233 ppm at 600 seconds after the start of the protocol. In protocol 2, using 60 ml of EtOH and 25 g of CO₂, the highest mean concentration of EtOH was 14388 ppm at 120 seconds after the start of the protocol. The lowest mean concentration of EtOH was 233 ppm at 600 seconds after the start of the protocol.
concentration was 566.33 ppm at 600 seconds after protocol initiation. A separate protocol was run to measure CO₂ concentrations. The peak mean CO₂ concentration using 60 mL of EtOH and 25 g of CO₂ was 6219.33 at 300 seconds. The lowest mean CO₂ concentration was 1162.33 at 60 seconds after the start of the protocol. In an attempt to simulate the AWOL, we used a home nebulizer and measured EtOH concentrations as in the previous protocols. The highest mean EtOH concentration was 14600 ppm at 240 seconds, and the lowest was 1565 ppm at 60 seconds.

**Conclusion:** This study demonstrates the potentially dangerous concentrations of carbon dioxide and EtOH generated when ethanol and dry ice are combined, as well as when vaporized using an air compressor.

### 16 Influence of Nitroglycerin Co-Administration on Hemoglobin Based Oxygen Carrier (HBOC)-201 Vasconstriction During Resuscitation in a Swine Survival Model of Liver Injury and Severe Hemorrhagic Shock

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**Background:** Fluid resuscitation with hemoglobin-based oxygen carrier (HBOC)-201 could potentially promote survival in trauma patients with severe hemorrhagic shock, but HBOC-induced vasconstriction due to nitric oxide scavenging may have adverse effects.

**Objectives:** This IACUC-approved study evaluated the effect of concomitant infusion of the nitric oxide generator nitroglycerin (NTG) on HBOC-201 vasconstriction during fluid resuscitation for severe hemorrhagic shock and on 72-hr survival.

**Methods:** Thirty-two anesthetized swine (28±2 kg) underwent an Injury phase (0–15 min) with a 45 ml/kg catheter hemorrhage, liver crush and laceration with uncontrolled hemorrhage and were randomized into five fluid groups at 15 min: Pre-Hospital resuscitation phase (15–60 min): fluid boluses (15 mL/kg over 5 min) were administered. A separate protocol was run to measure CO₂ concentrations. A peak mean CO₂ concentration was 566.33 ppm at 600 seconds after protocol initiation. A separate protocol was run to measure CO₂ concentrations. The peak mean CO₂ concentration using 60 mL of EtOH and 25 g of CO₂ was 6219.33 at 300 seconds. The lowest mean CO₂ concentration was 1162.33 at 60 seconds after the start of the protocol. In an attempt to simulate the AWOL, we used a home nebulizer and measured EtOH concentrations as in the previous protocols. The highest mean EtOH concentration was 14600 ppm at 240 seconds, and the lowest was 1565 ppm at 60 seconds.

**Results:** Injury phase resulted in severe decompensated shock in all swine. Target sAoP was achieved in less infusion time (TI) with HBOC-201 during early resuscitation. MPAP in all HBOC groups continued to rise until HBOC infusion stopped at 60 min. MPAP elevation in all HBOC groups paralleled pulmonary vascular resistance and persisted from 90 to 300 minutes but did not have a significant negative effect on O₂ extraction ratio. Survival time (TS) was greater in all HBOC vs. HES groups but not different between HBOC groups. 72-hr survival was 6/8 in HBOC, 6/8 in HBOC20N, and 7/7 in HBOC40N versus 0/5 and 0/4 in the two HES groups. Post-mortem lung exam scores (LE) were better in HBOC40N vs. HBOC and HBOC20N.

**Conclusion:** Nitroglycerin resulted in early attenuation of HBOC-201 vasoconstriction but the effect was not sustained. This may be due to the short half-life of NTG compared to HBOC-201. Improved 72-hr survival associated with NTG administration was not demonstrated. This may be due to the high survival rate seen in all of the HBOC-201 groups.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Resuscitation Fluid</th>
<th>Group N</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI - min</td>
<td>HBOC</td>
<td>10±10</td>
</tr>
<tr>
<td></td>
<td>HOBOW20N</td>
<td>11±7</td>
</tr>
<tr>
<td></td>
<td>HOBOW40N</td>
<td>11±7</td>
</tr>
<tr>
<td></td>
<td>HES</td>
<td>6±2</td>
</tr>
<tr>
<td></td>
<td>HES20N</td>
<td>5±2</td>
</tr>
<tr>
<td>sAoP - mmHg</td>
<td>HBOC</td>
<td>78±23</td>
</tr>
<tr>
<td></td>
<td>HBOC20N</td>
<td>73±20</td>
</tr>
<tr>
<td></td>
<td>HBOC40N</td>
<td>72±0</td>
</tr>
<tr>
<td></td>
<td>HOBOW20N</td>
<td>72±0</td>
</tr>
<tr>
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<td>72±0</td>
</tr>
<tr>
<td></td>
<td>HES</td>
<td>7±2</td>
</tr>
<tr>
<td></td>
<td>HES20N</td>
<td>7±2</td>
</tr>
<tr>
<td>MPAP - mmHg</td>
<td>HBOC</td>
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</tr>
<tr>
<td></td>
<td>HBOC20N</td>
<td>31±8</td>
</tr>
<tr>
<td></td>
<td>HBOC40N</td>
<td>27±7</td>
</tr>
<tr>
<td></td>
<td>HOBOW20N</td>
<td>27±7</td>
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<tr>
<td></td>
<td>HOBOW40N</td>
<td>27±7</td>
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<td></td>
<td>HES</td>
<td>7±2</td>
</tr>
<tr>
<td></td>
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<tr>
<td>LE</td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td>HOBOW20N</td>
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<td>HOBOW40N</td>
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<td>HES</td>
<td>7±2</td>
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<tr>
<td></td>
<td>HES20N</td>
<td>7±2</td>
</tr>
</tbody>
</table>

### 17 Single Dose Tribosupplementation With Human Synoviocyte Lubricin Lowers Urinary Ctxii and Preserves Symmetric Weightbearing in the Rat ACL Transection Osteoarthritis Model

Gregory D Jay, Ling Zhang, Kimberly Waller, Braden Fleming, and Khaled Elsaid

Brown University, Providence, RI

**Background:** Anterior cruciate ligament (ACL) injury is a significant risk factor for development of post-traumatic osteoarthritis (OA). Lubricin (PRG4) is a mucinous glycoprotein, secreted from superficial zone chondrocytes with chondroprotective and anti-adhesive properties.

**Objectives:** We hypothesized that markers of cartilage damage are minimized in lubricin-treated animals when compared to placebo.

**Methods:** Measures included histology, urinary crosslinked telopeptide type-II (CTXII), and qat analysis. ACL transection was performed in the right hind limb of 8–10 week old male Lewis rats (n=40). Intra-articular PBS (n=20) or lubricin (SBH Sciences, Natick, MA) (n=20; 1.4 mg/ml) was injected on day 7 post-injury. Hind limbs from one half of the animals in each group were harvested on day 35 and the remaining animals on day 70 post-injury. Approvals were obtained from the Animal Use Committee.
Background: Over the past decade, clinicians have become increasingly reliant on computed tomography (CT) for the evaluation of patients with suspected acute appendicitis. To limit the radiation risks and costs of CT, investigators have searched for biomarkers to aid in diagnostic decision-making.

Objectives: We evaluated one such biomarker, Calprotectin or S100A8/A9, to determine its diagnostic performance characteristics in a developmental biomarker assay in a multicenter investigation of patients presenting with acute abdominal pain suspicious for acute appendicitis.

Methods: A prospective, double-blinded, single-arm, multicenter study was performed in 13 emergency departments from August 2009 to April 2010 on patients presenting with acute abdominal pain suspicious for acute appendicitis. Plasma samples were tested using the investigational Calprotectin assay. The primary outcome of acute appendicitis was determined by histopathology for patients undergoing appendectomy, or 2-week telephone follow-up for patients discharged without surgery. The sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) of the assay were calculated using the prespecified cutoff value of 14 units established by the manufacturer.

Results: Of 1052 enrolled patients, 848 met criteria for analysis (median age 24.5 years, 57% female, 50% white) with a 27.5% prevalence of acute appendicitis. The sensitivity and specificity for the Calprotectin assay for diagnosing acute appendicitis were estimated to be 96% (95% confidence interval [CI] = 93% to 98%) and 16% (95% CI = 13% to 19%), respectively. Negative predictive value (NPV) was 92% (95% CI = 85% to 96%), and PPV was 30% (95% CI = 27% to 34%).

Conclusion: In patients presenting with acute abdominal pain suspicious for acute appendicitis, we found the Calprotectin biomarker to perform with high sensitivity but very limited specificity.

19 Safety and Efficacy of Patient Controlled Analgesia in the Emergency Department
Adrienne Birnbaum, Rebecca Touger, and Polly Biju
Albert Einstein College of Medicine, Bronx, NY

Objective: To assess efficacy and safety of patient-controlled analgesia (PCA) in the emergency department (ED) and to compare two PCA dosing regimens.

Methods: A randomized controlled trial with three treatment arms was performed in an urban ED with 75,000 annual adult visits. A convenience sample of ED patients ages 18 to 65 with abdominal pain of ≤7 days duration requiring IV opioid analgesia was enrolled between 4/2009 and 6/2010. All patients received an initial dose of 0.1 mg/kg IV morphine followed by physician-managed analgesia as needed. PCA arms also received IV morphine with demand doses of 1 mg or 1.5 mg with 6 min lock-out. Pain intensity was rated by patients at baseline and every 30 min for 2 hr on an 11 point numeric rating scale (NRS). Satisfaction with pain treatment, desire for same treatment in the future, and need for additional analgesia were assessed at study end. Adverse events (O2 sat < 92%, RR < 10/min, systolic BP < 90 mm Hg and naloxone use) were counted. Hierarchical linear model analyses were used to test the difference between the groups in two phases: baseline to 30 min, and 30 to 120 min.

Results: Two hundred and six patients were enrolled. A sharp, nearly identical decline in NRS occurred from baseline to 30 minutes in the three groups (see the Figure) (overall group effect: p=0.48). Between 30 and 120 min there was little decline in the non-PCA NRS, while both PCA groups continued to decline (overall group effect: p=0.004). Change in mean NRS from 30 to 120 min was 0.4 (95% CI = -0.4, 1.2), 1.6 (95% CI 0.9, 2.3); and 1.5 (95% CI 0.8, 2.2) in the non-PCA, 1 mg, and 1.5 mg groups, respectively. More PCA than non-PCA patients reported satisfaction, wanting the same pain management in the future, and not wanting further analgesics at 120 min (see the Table). There were no clinically or statistically significant differences in mean pain intensity from baseline to minutes (p=0.53) or from 30 to 120 minutes (p=0.92) nor secondary outcomes between the two PCA groups. One PCA patient had a transient oxygen saturation of 88% after the bolus only and one non-PCA patient had a brief drop in systolic BP to 87 mm Hg.

Conclusion: Patient-controlled analgesia was associated with greater decline in pain over time, similar safety, and increased...
satisfaction when compared to physician-managed analgesia. These results do not provide support for superiority of a 1.5 mg PCA bolus dose over 1 mg.

<table>
<thead>
<tr>
<th>Secondary outcomes at 120 minutes</th>
<th>Non-PCA</th>
<th>PCA 1.0 mg</th>
<th>PCA 1.5 mg</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfied</td>
<td>48 (71.6)</td>
<td>62 (92.5)</td>
<td>66 (95.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Would want same pain management in future</td>
<td>47 (71.2)</td>
<td>60 (92.3)</td>
<td>64 (94.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Do not want more pain medication</td>
<td>40 (64.5)</td>
<td>55 (84.6)</td>
<td>58 (92.1)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**A Randomized Trial Comparing Stress Cardiac MRI to Conventional Testing Among Observation Unit Patients With Chest Pain**

Chadwick D Miller¹, James W. Hoekstra², Cedric Lefevbre³, Howard Blumstein¹, Craig A Hamilton¹, Erin N. Harper¹, Simon Mahler¹, Deborah B Diercks², Rebecca H Neiberg¹, and W. Gregory Hundley¹ ¹Wake Forest University Health Sciences, Winston-Salem, NC; ²University of California, Davis Medical Center, Sacramento, CA

**Background:** Stress cardiac magnetic resonance (CMR) is highly accurate for acute coronary syndrome (ACS).

**Objectives:** Among observation unit (OU) patients with chest pain, to determine the relevant comparison of CMR versus other modality stress on efficiency and disposition decisions.

**Methods:** A randomized clinical trial was conducted at a single center. Participants with low to moderate risk for ACS, but without definite ACS based on the initial cardiac markers and ECG, were recruited from the emergency department (ED). All patients received OU care and were randomized to stress CMR (CMR group) or usual care imaging as determined by the care providers (UC group). Patients were followed by phone and chart review to determine the occurrence of ACS. The primary outcome was hospital length of stay (LOS); other outcomes were catheterization not leading to revascularization, and the accuracy of cardiac-related admission decisions from the OU based on the occurrence of ACS at 30 days. Sample size was chosen to provide 90% power to detect a 7.8 hour mean difference in LOS. The primary outcome was log-transformed and compared with linear regression based on intention to treat.

**Results:** Over 18 months, 124 subjects were enrolled; four were screen failures and were removed from the protocol, leaving 120 subjects in the final cohort (CMR=60, UC=60). The mean age was 53 (SD 10.7) years. Demographics were similar among groups; 4% had a prior myocardial infarction (MI). CMR was obtained in 83% of CMR subjects. Stress echo was the most common imaging modality in the UC group (65%). Median LOS was 24.2 hours in the CMR group compared to 23.6 hours in the UC group (p=0.75). Non-therapeutic cardiac catheterizations were performed in 0% of CMR subjects compared to 3% of UC subjects (p=0.50). Between enrollment and 30 days, ACS occurred in four participants (two in each group). No CMR group subjects had ACS after the index visit; one UC subject was discharged from the OU and had MI within 30 days. Hospital admissions were not significantly different (CMR 17% vs 7%, p = 0.15). The accuracy of OU admission decisions was high in both groups (CMR 87% vs 93%, p = 0.36).

**Conclusion:** Among patients at relatively low risk for ACS undergoing imaging in a chest pain OU, stress CMR promotes a similar LOS with a similar incidence of cardiac catheterizations compared to an alternate provider-determined imaging approach. Both strategies had high admission decision accuracy.

**Intravenous Nicardipine and Labetalol Use in Hypertensive Patients With Signs or Symptoms Suggestive of End Organ Dysfunction in the Emergency Department**

Chad M. Cannon¹, Brigitte Baumann², Abhinav Chandra³, David Cline⁴, Deborah Diercks², Amy Hsu⁵, Preeti Jois-Bilowich⁷, Brian Kaminski²⁵, Phil Levy⁸, Richard Nowak¹⁰, Jon Schrock¹¹, Joseph Varon¹², and W. Frank Peacock⁶

¹University of Kansas Hospital, Kansas City, KS; ²Cooper University Hospital, Camden, NJ; ³Duke University Medical Center, Durham, NC; ⁴Wake Forest University School of Medicine, Winston Salem, NC; ⁵University of California, Davis Medical Center, Sacramento, CA; ⁶The Cleveland Clinic, Cleveland, OH; ⁷University of Florida College of Medicine, Gainesville, FL; ⁸Toledo Hospital, Toledo, OH; ⁹Wayne State University, Detroit, MI; ¹⁰Henry Ford Hospital, Detroit, MI; ¹¹MetroHealth Medical Center, Cleveland, OH; ¹²University of Texas Health Science Center, Houston, TX

**Background:** Pharmacologic treatment of hypertensive emergencies in the emergency department (ED) is typically not withheld waiting for laboratory or radiographic confirmation of the suspected end organ damage (EOD).

**Objectives:** To compare the efficacy and safety of FDA-recommended dosing of nicardipine (NIC) versus labetalol (LAB) for the management of hypertensive (ED) patients with signs and/or symptoms (S/S) suggestive of EOD.

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<table>
<thead>
<tr>
<th>Heart Rate (bpm)</th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>nicardipine</td>
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<table>
<thead>
<tr>
<th>% change in SBP</th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nicardipine</td>
<td>labetalol</td>
</tr>
</tbody>
</table>

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**Conclusion:** Among patients at relatively low risk for ACS undergoing imaging in a chest pain OU, stress CMR promotes a similar LOS with a similar incidence of cardiac catheterizations compared to an alternate provider-determined imaging approach. Both strategies had high admission decision accuracy.
Methods: This is a sub-analysis of the multi-center CLUE trial that randomized hypertensive ED patients to either NIC or LAB to reach a physician-defined target systolic blood pressure (SBP). Eligible patients had two SBP measures > 180 mmHg at least 10 mins apart, no contraindications to NIC or LAB, and showed S/S suggestive of EOD preceding treatment. Before randomization, the emergency physician specified a target SBP ± 20 mmHg. NIC dosing was 5 mg/hr, titrated q5 mins by 2.5 mg/hr until the target range (TR) was reached or max of 15 mg/hr was achieved; once in the TR, NIC was decreased to 3 mg/hr. Bolus LAB began at 20 mg over 2 mins, and was repeated at 20, 40, or 80 mg boluses q10 mins until the TR was reached, or a max total of 300 mg. The active treatment phase was 30 mins.

Results: Of the 141 eligible subjects, 51.7% were female, and 81.6% were black, with a mean age of 52.2 ± 13.9 years. Randomization resulted in 70 patients receiving NIC and 71 LAB. Overall median initial SBP and diastolic BP was similar in each treatment cohort: 210 mmHg (IQR 199, 226) and 116 mmHg (IQR 105.0, 126.0) (p=0.862 and p=0.686, respectively). There were no significant differences in demographics, laboratories, or adverse events between the NIC and LAB populations except the NIC patients were more likely to have a history of diabetes (41.4% versus 25.7%, p=0.05). Within 30 mins, NIC patients more often reached the target SBP range than LAB (91.4 vs. 76.1%, 95% CI ~27.3 to ~3.5). Multivariable modeling adjusting for all significant baseline variables, and forcing in the enrolling site, showed NIC patients were more likely to be in TR by 30 mins than patients receiving LAB (OR 3.65, 95% CI 1.31 to 10.18, C statistic = 0.72).

Conclusion: In hypertensive ED patients with S/S suggestive of EOD, NIC-treated patients are more likely to reach a target SBP range within 30 mins than patients receiving LAB.

22 Can Medical Students Learn Suturing Skills at Home?
Andrew Wackett, Michael Beck, Adam Singer, and Henry Thode
Stony Brook University Medical Center, Stony Brook, NY

Background: Suturing is an important skill for medical students to learn. Academic emergency physicians are often delegated this teaching responsibility, and this task can be significant. Literature suggests many skills can be self-taught. Does this apply for suturing?

Objectives: To compare traditional faculty-directed classroom-based teaching (FDCBT) and self-directed home-based teaching (SDHBT) of laceration repair skills. We hypothesized there would be no difference in learning across teaching modalities.

Methods: Study Design: randomized, controlled, trial. Setting: academic medical center. Subjects: 3rd year medical students. Interventions: subjects were randomly assigned to the FDCBT, SDHBT, or combined group. In the FDCBT group, students watched a video on laceration repair and practiced the skills with direct faculty feedback; they were not given the video or materials to practice further. In the SDHBT group, students were given the video, a laceration kit, and a pig’s foot to practice the skills at home. In the combined group, students were both taught in the classroom and given the video and materials to practice at home. Two weeks later, students were tested on a porcine model. A blinded reviewer evaluated the skills using a standardized checklist. Measures: prior experience and successful performance of the skills including sterile, anesthetic, and suture technique. Data Analysis: descriptive statistics and chi square analysis.

Results: There were 86 subjects (25 FDCBT, 33 SDHBT, and 28 combined). The mean amount of prior experience was higher for the FDCBT group compared to the SDHBT and combined groups (2.50, 1.06, and 1.07, respectively). Prior experience was not significantly associated with any of the measurements. Performance (% correct) between groups varied from 85.3-90.3% for anesthetic technique; 89.7-93.0% for sterile technique; and 82.6-85.0% for overall suture technique. Specifically, performance varied from 83.7-85.4% for interrupted sutures, 80.0-91.3% for vertical mattress sutures, 81-92.6% for continuous sutures, and 52.2-81.5% for deep dermal sutures. There were no statistically significant differences between groups. There was a tendency for the SDHBT group to perform better than the FDCBT group at deep dermal sutures (81.5% vs 52.2%) (p=.08).

Conclusion: Self-directed teaching is as effective as faculty-directed teaching of laceration repair skills.

23 Ultrasound Evaluation of the Effect of Head Rotation on the Relationship of the Internal Jugular Vein and Carotid Artery
Raymond Merritt 1, Charlotte Derr 1, Eric Zevallious 1, Katheryne Downes 2, Larry Land 1, Megan Lasserter 1, Daryl Denitis 2, and Richard Paula 1
1University of South Florida/Team Health, Tampa, FL; 2University of South Florida, Tampa, FL

Background: Previous studies have shown that when the internal jugular vein (IJV) is 46–90 degrees in relation to the carotid artery (CA), safe cannulation of the vein would be difficult, if not impossible.

Objectives: Our goal was to further examine the anatomical relationships of the IJV and CA during head rotation to determine what head position would decrease the risk for CA puncture.

Methods: This is a prospective study using a convenience sample of 100 emergency department patients. Patients were placed in Trendelenburg and the anatomic relationships of the right and left IJVs and CAs were recorded with head rotation at 0, 45, and 80 degrees. All images and measurements were obtained with a 10–5 MHz linear array transducer in the transverse orientation. A goniometer was used to determine the position of the IJV relative to the CA. Using the center of the CA as the horizontal axis, +0 to +180 degrees depicted the vein as superficial to the artery and 0 to –180 degrees as deep to the artery. The data were then sorted by 45 degree increments and degree of head rotation. Patients who had the IJV in a 46–90 degree relationship to the CA were deemed at high risk for carotid puncture.

Results: At 0 degrees of head rotation, 10.1% of the right IJV and 19.1% of the left IJV were in the high risk zone. At 45 degrees of head rotation, 16.1% of the right IJV and 24% of the left IJV were in the high risk zone. At 80 degrees of rotation, 24.2% of the right IJV (p<0.001) and 39% of the left IJV (p<0.001) were in the high risk zone. In addition, 3% of patients had reversal of the normal anatomy, placing the CA more superficial to the IJV.

Conclusion: Our study correlates with the previous studies on this topic. Increasing head rotation will increase the possibility of complications during IJV cannulation. The left IJV appears to have a higher degree of difficulty as compared to the right. Placing the head in the neutral position, avoiding rotation, and using an ultrasound guide is suggested to minimize complications.
24 Single-operator Ultrasound-guided Intravenous Line Placement by Emergency Nurses
Allison R. Sarfl, Amir H. Darvish, Sunil D. Shroff, Matthew B. Mostofi, and Scott G. Weiner
1Tufts University School of Medicine, Boston, MA; 2Tufts Medical Center, Boston, MA

Background: Emergency physicians (EPs) have become facile with ultrasound-guided intravenous line (USIV) placement in patients with difficult access, though the procedure can be time-consuming and distract the EP from other cognitive activities.

Objectives: We hypothesize that, with adequate training, emergency nurses (RNs) can effectively perform single-operator USIV placement with less physician intervention.

Methods: Interested RNs received a 2 hour tutorial from an RDMS-certified EP. Patients were eligible for inclusion if they had either two failed blind peripheral IV attempts, or if they reported or had a known history of difficult IV placement. Consenting patients were randomized to have either nurse USIV placement or standard care (SC). Researchers observed the time required and number of skin punctures, and then asked patients to rate satisfaction and pain on a scale of 0–10.

Results: Twenty-five patients were included, of whom 15 were randomized to USIV and 10 to SC. There were no significant differences in race (p = 0.30), sex (p = 0.40), or reason for inclusion (p = 0.96), though SC patients were older (50.4 vs 42.8 years, p = 0.04). Time to IV placement was not significantly different (USIV: 23.7 vs SC: 28.1 minutes, p = 0.36), nor was number of skin punctures (USIV: 1.9 vs SC: 2.3, p = 0.22) or patient satisfaction (USIV: 93.3% vs SC: 77.8%, p = 0.26). Patient perception of pain was lower with USIV (4.1 vs 6.6, p = 0.03). Physicians were called to help in 7/10 of SC cases but only 3/15 USIV cases (p = 0.01). Ultrasound was employed in 10/10 (100%) of cases when physicians helped.

Conclusion: This pilot study demonstrates that emergency nurses can be successfully trained to perform ultrasound-guided IV placement in patients with difficult IV access. The technique greatly reduces the requirement for EP intervention and results in less patient perception of pain.

25 Etoricoxib Prevents ‘First of Ramadan’ Headache
Michael J Drescher, Rafael Torgovick, Naim Shehadeh, Samer Abu Khalef, Arnold Gammaitoni, and Zev Wimpfheimer
1Hartford Hospital/University of Connecticut, Hartford, CT; 2MSD (Merck) Israel, Tel Aviv, Israel; 3Rambam Medical Center, Haifa, Israel; 4Shaare Zedek Medical Center, Jerusalem, Israel; 5Merck Inc, North Wales, PA

Background: Religious fasting is associated with headache. This has been documented as ‘First of Ramadan Headache’ and ‘Yom Kippur Headache.’ Rofecoxib and etoricoxib, both COX-2 inhibitors with 17 and 22 half-life hours, respectively, have been shown effective in preventing fasting headache when taken just prior to the 25 hour Yom Kippur fast. Rofecoxib is no longer available.

Objectives: We hypothesized that etoricoxib would be effective in preventing fasting headache during the dawn to dusk Ramadan fast.

Methods: We performed a double-blind, randomized, prospective, cross-over trial of Etoricoxib 90 mg vs placebo, taken just prior to the onset of fasting, during the first two weeks of Ramadan in August 2010. Healthy adults aged 18–65 were enrolled from the community. Each subject received six days of drug and six days of placebo in a blinded fashion, with a two day placebo ‘washout period’ in between. Subjects filled out a headache data form and questions regarding headache history and a post-fast ‘headache diary’ during the fast. We compared incidence, time of onset and intensity of headache, general ease of fasting, and side effects in control and treatment groups.

Results: We enrolled 220 patients and 188 completed the post fast questionnaire (85%). On day one of the fast, of those subjects receiving etoricoxib (n = 96), 20 or 20.8% vs 42 or 45.7% of the placebo group (n = 92) developed any headache during the fast (p = 0.001). On day two of the fast, 17.3% taking medication vs 30.8% of the placebo group developed headache (p = 0.05). In subsequent fast days fewer subjects got headache in the drug vs placebo groups, but this generally did not reach statistical significance, as the incidence in the placebo group fell to below 25%.

Conclusion: Etoricoxib 90 mg taken prior to Ramadan fasting ritual fast decreases incidence of headache, most prominently in the first two days of the month-long fast. It appears that the incidence of fasting headache decreases as the month progresses.

26 Effect of the Volume of Intravenous Fluid Administration in Pediatric Diabetic Ketoacidosis
Katherine Bakes, Sara Deakyne, Kim McFann, Alison Brent, and Arleta Rewers
1Denver Health Medical Center, Department of Emergency Medicine, Denver, CO; 2The Children’s Hospital, Denver, CO; 3The University of Colorado, Denver, CO; 4The University of Colorado, Department of Pediatrics, Denver, CO

Background: The volume of initial intravenous fluid administration in diabetic ketoacidosis (DKA) has been linked to the risk of life-threatening cerebral edema and remains controversial. A small study in adults suggested that more modest amounts of fluids in the first four hours of rehydration resulted in more rapid recovery and reduced treatment costs.

Objectives: The study objective was to determine if the volume of initial fluid administration in pediatric patients with DKA affects the rate of normalization of serum bicarbonate, beta-hydroxybutyrate-rate (β-OHB), and pH, as well as the length of treatment (LOT).

Methods: Diabetic ketoacidosis was defined as serum glucose > 250 mg/dL and pH < 7.30 or serum bicarbonate < 15 mmol/L. Fifty children with DKA (mean age 9.3 years ± 4.7) were randomized to receive fluids at either a slow rate (10 mL/kg bolus followed by 1.25 x maintenance rate) or fast rate (20 mL/kg bolus followed by 1.5 x maintenance rate) (n = 25 in each). The primary outcomes were time to bicarbonate normalization and LOT. Kaplan-Meier survival analysis and the log-rank statistic were used to evaluate time to metabolic normalization and LOT.

Results: Participants’ pre-treatment characteristics were similar except for higher baseline bicarbonate levels in the slower infusion group compared to the faster infusion group (10 ± 3 vs. 8 ±4 mmol/L respectively, p = 0.04). After adjusting for this initial difference, time to normalization of bicarbonate did not differ between the slow (5.9 h, 95% CI 5.3–8.4) and fast (7.9 h, 95% CI 5.3–8.4) groups (p = 0.63). Time to pH normalization also did not differ (4.7 h, 95% CI 3.8–9.3 vs. 6.9 h, 95% CI 4.3–8.7, respectively, p = 0.42). The slow infusion group had a nearly significant shorter LOT: 20.5 h, 95% CI 16.9–23.2 vs. 24.5 h, 95% CI 18.5–35.0, p = 0.07. The slopes of bicarbonate, β-BOH, and pH normalization did not differ between groups. No patient developed cerebral edema.

Conclusion: A slower initial fluid infusion rate in treatment of pediatric DKA did not significantly affect metabolic normalization time or length of treatment. Further investigation in a larger sample is warranted given the nearly significant shorter LOT in the slower infusion rate group.

27 Pharmacokinetics of High-Dose Oral Thiamine Hydrochloride
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Background: Thiamine is used to treat several thiamine deficiency disorders and may have a role in treating diabetes, heart failure, and hypermetabolic states. Expert panels recommend that thiamine be given parenterally for these conditions because oral thiamine is thought to be absorbed by a rate-limited active transport mechanism which prevents adequate plasma levels from being reached rapidly. However, animal studies suggest that this may be incorrect.

Objectives: The purpose of this study was to determine the pharmacokinetic profiles of oral thiamine hydrochloride for 100 mg, 500 mg, and 1500 mg.

Methods: This was a randomized, double-blind, single-dose, four-way crossover study with one week elapsing between trials. After an overnight fast, 14 healthy volunteers ingested a single dose of placebo, 100 mg, 500 mg, or 1500 mg of thiamine. Blood specimens were obtained at baseline and at 0.5, 1, 1.5, 2, 3, 4, 5, 6, 8, and 10 hours after taking the study medication. The specimens were immediately placed on ice and protected from light. The plasma thiamine levels increased linearly with dosage across the range tested.

Results: The AUC values (nmol/L x hour) for plasma were 150 ± 13, 325 ± 16, 763 ± 72, and 2212 ± 418 for 0 mg, 100 mg, 500 mg, and 1500 mg, respectively. The overall effect of dosage on AUC was significant as were all pairwise comparisons (p<0.05). Time to peak plasma concentration was 3.8 hours.

Conclusion: Our study demonstrates that high blood levels of thiamine can be achieved rapidly with oral thiamine hydrochloride, and the blood levels increase linearly with dosage across the range we tested.

29 Evaluation of a Novel Wound Closure Device: A Randomized Clinical Trial
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Background: Wound closure with topical skin adhesives has increased over the last decade. A novel wound closure device combining a mesh tape and octylcyanoacrylate (OCA) topical skin adhesive was developed to facilitate wound closure and enhance its strength.

Objectives: The objective of the current study was to determine whether the incidence of wound dehiscence after laceration repair with the new device was equivalent to that after use of a high viscosity OCA as both dexamethasone and the commonly prescribed AMS prophylactic, acetazolamide.

Methods: Study Design: multicenter, randomized clinical trial. Setting: nine academic and community emergency departments and urgent care centers. Subjects: emergency department (ED) patients with simple traumatic lacerations. Interventions: lacerations were randomly closed with a high viscosity OCA or mesh tape/OCA combination. Outcomes: the rate of complete wound edge apposition at 14 days, wound infection rates at 14 and 30 days, and the percentage of optimally appearing scars at 30 days after closure. Data Analysis: assuming a maximal clinically acceptable difference for equivalence of 8% in the rate of completely apposed wound edges, a sample of at least 138 patients in the tape/OCA group and at least 69 in the OCA alone group would give 80% power and a one-sided significance level of 5%.

Results: During the study period we enrolled 216 subjects, of whom 143 were randomized to the tape/OCA combination and 73 to the OCA alone group. Most wounds were located on the face and the upper extremities. Mean laceration length was similar in patients treated with the OCA/tape combination and OCA alone (2.1 cm; difference 0.1, 95% CI -0.45 to 0.58 cm). The rate of complete wound edge apposition at 14 days was higher in wounds treated...
Background: Accurate diagnosis of ST elevation myocardial infarction (STEMI) is complicated by the presence of mimickers such as pericarditis, one of the most common reasons for (negative) emergency cardiac catheterization. Beyond common electrocardiogram (ECG) criteria for pericarditis, a rule of ST segment elevation in lead II greater than lead III (II > III) has been suggested in textbooks and lectures to suggest pericardial disease (PD) and not STEMI.

Objectives: The objective of this study is to define the operating characteristics for the ability of the II > III rule to discriminate PD from STEMI.

Methods: An IRB-approved retrospective cohort study of all patients from an academic emergency department (ED) with the diagnosis of PD (pericarditis, pericardial effusion, pericardial tamponade) or inferior STEMI from 2005–2009 was performed. Inferior STEMI patients were selected as ST elevation in lead II greater than lead III (II > III) has been suggested in textbooks and lectures to suggest pericardial disease (PD) and not STEMI.

Results: We enrolled 283 patients: 122 with PD and 161 with STEMI. When the rule was PD+, this had a positive predictive value of 19/122 (16%, 95% CI 10–23%) and specificity was 148/161 (92%, 95% CI 87–95%). There was moderate but significant agreement between readers. Despite reports that II > III aids the ECG diagnosis of PD, this study suggest that the II > III rule does not have a level of diagnostic accuracy reliable for clinical decision-making. This study is limited by the fact that we artificially altered population prevalence, and only including PD and STEMI ECGs.

Conclusion: When compared with OCA alone, the novel tape/OCA combination was less than the predetermined acceptable difference of less than 8% between the wounds closed with the tape-OCA combination and the OCA alone. There were no between-group differences in rates of infection and optimally appearing scars.

Background: Extensive cardiac testing in emergency department (ED) patients is resource-intensive and may involve substantial radiation exposure.

Objectives: Our aim was to identify patients with chest pain at very low risk for cardiac events for whom less extensive testing might be appropriate.

Methods: We enrolled patients over 24 years of age with a primary complaint of chest pain from three urban academic EDs in two countries. Patients with acute ST-segment elevation on the initial ECG, hemodynamic instability, or a history of cocaine use were excluded. On duty physicians completed standardized data collection forms prior to diagnostic testing. A second on-duty physician assessed the interobserver reliability of clinical variables in a subset (n=250) of patients. The primary adjudicated outcome was acute myocardial infarction, revascularization, or death within 30 days. Variables significantly associated with the primary outcome (95% CI of OR did not cross one) and substantial interobserver reliability (kappa > 0.6) were considered for inclusion in the rule. Recursive partitioning was used to derive the prediction rule.

Results: We enrolled 2718 patients with the following characteristics: mean age (SD) 60.0 (14.9) years, 53% male, 21% history of diabetes, and 23% history of myocardial infarction. There were 336 patients (12%) who had a cardiac event within 30 days (6%
AMI, 10% revascularization, 0.2% death). There were 38 variables significantly associated with the primary outcome on univariable analyses, and 15 variables from the clinical history with kappa values > 0.6. We derived a prediction rule consisting of the absence of five predictors: age ≥ 50 years, acute ischemic ECG changes, known coronary artery disease, pain typical for acute coronary syndrome, and any cardiac troponin value > 99th percentile on serial measurements. The rule missed no outcomes and was 100% (95% CI 97.2–100.0) sensitive and 20.9% (95% CI 16.9–24.9) specific for a cardiac event within 30 days.

**Conclusion:** We developed a prediction rule that identifies one in five chest pain patients at very low-risk for a cardiac event. Further study of the proposed decision rule, including prospective validation, could allow physicians to more accurately identify very low-risk patients for whom additional diagnostic investigation may be unnecessary.

33 Development and Validation of a Clinical Prediction Rule for the Early Discharge of Low-Risk Emergency Department Patients With Potential Ischemic Chest Pain

Frank Scheuermeyer, Grant Innes, Hubert Wong, Eugenia Yu, Barb Boychuk, Ken Gin, Eric Grafstein, and Jim Christenson

**University of British Columbia, Vancouver, BC, Canada**

**Background:** Current guidelines suggest that patients presenting to emergency departments (ED) with low-risk but potentially ischemic chest pain cannot be safely discharged without extensive investigations.

**Objectives:** We sought to derive and validate a clinical prediction rule that would miss less than 2% of patients with acute coronary syndrome (ACS) and allow 30% of patients without ACS to be discharged within two hours without further investigations or follow-up.

**Methods:** This prospective ED cohort study enrolled 1669 consenting eligible subjects. Investigators determined 30-day outcomes according to predetermined explicit diagnostic criteria. A recursive partitioning model incorporated reliable and predictive cardiac risk factors, pain characteristics, EKG findings, and cardiac biomarker results.

**Results:** In the derivation cohort, 165/763 patients (21.6%) had ACS diagnosis. The derived ACS prediction rule was 100.0% sensitive and 18.4% specific. In the validation cohort, 119/906 patients (13.1%) had ACS, and the prediction rule was 99.2% sensitive (95% CI 95.4 - 100.0%) and 23.4% specific (95% CI 20.6 - 26.5%). Based on the rule, patients have a very low risk of ACS if arrival and two-hour troponin levels are normal, the initial EKG is non-ischemic, there is no prior history of ACS or nitrate use, age is less than 50, and defined pain characteristics are met.

**Conclusion:** The Vancouver Chest Pain Rule defines a cohort of chest pain patients who can be safely discharged from the ED within two hours. Use of this rule would allow high diagnostic ACS sensitivity while preserving health care resources. Additional validation is required.

34 Effect of a Decision Aid on Patient Knowledge, Patient Satisfaction, Safety, and Resource Use in Low-risk Emergency Department Patients With Chest Pain: A Randomized Trial

Erik P Hess, Meghan A Knoedler, Jeff Kline, Nilay D Shah, Margaret A Breslin, Megan E Branda, Laurie J Pencille, Brent R Asplin, David M Nestler, Annie T Sadosty, Ian G Hoekstra, and Chadwick D Miller

**Mayo Clinic, Rochester, MN; 2Carolinas Medical Center, Charlotte, NC; 3University of Ottawa, Ottawa, ON, Canada**

**Background:** Patient involvement in the choice of whether to undergo emergency department observation unit (EDOU) admission and cardiac stress testing or follow-up with a physician on an urgent basis could increase knowledge, increase satisfaction with the decision-making process, and safely decrease resource use.

**Objectives:** We tested this hypothesis in a randomized trial.

**Methods:** We developed and tested Chest Pain Choice, a decision aid that communicates the pre-test probability of an acute coronary syndrome (ACS) within 45 days and makes management options (EDOU admission and stress testing or 24–72 hr follow-up with a physician) explicit to the patient. Patients with a primary complaint of chest pain and no known coronary artery disease who were being considered for EDOU admission were eligible. Patient-clinician pairs were randomized to intervention (decision aid plus risk estimate) or usual care (no decision aid, no risk estimate). We used patient surveys and 30-day phone follow-up to assess the primary outcome (patient knowledge regarding their short-term risk for ACS, patient satisfaction, safety outcomes (delayed or missed ACS defined as acute myocardial infarction, ventricular arrhythmia, cardiogenic shock, or cardiac/unknown death), and resource use. Analysis was by intention to treat.

**Results:** The 205 patients had the following characteristics: mean age (SD) 54.7 (11.8), 59% female, 36% history of HTN, and 10% history of diabetes. Compared with usual care patients (n=104), patients receiving the decision aid (n=101) less frequently decided to be admitted to the EDOU for cardiac stress testing (58% vs 77%, absolute difference = 19%, 95% CI 6–31), had a lower rate of stress testing (74% vs 90%, absolute difference = 16%, 95% CI 6–26), had greater knowledge of their exact pre-test probability of ACS (25% vs 1%, absolute difference = 24%, 95% CI 15–33), and reported greater satisfaction with the decision-making process (strongly agree: 61% vs 40%; absolute difference = 21%, 95% CI 7–33). There were no cases of delayed or missed ACS in either arm.

**Conclusion:** Use of a decision aid in low-risk ED chest pain patients increases knowledge, increases satisfaction, and safely decreases resource use. In an era of health care reform, shared decision-making is a promising approach that may both increase patient engagement and decrease resource use.

35 Is the HEART Score Predictive of Major Adverse Cardiac Events in a Cohort of Emergency Department Patients With Low-Risk Chest Pain?

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**Background:** The HEART score is a decision aid designed to risk-stratify chest pain patients without cardiac imaging. It was recently validated in a cohort of emergency department (ED) patients with undifferentiated chest pain. The utility of the HEART score in patients at low-risk for acute coronary syndrome, likely to be managed in a chest pain observation unit, is unclear.

**Objectives:** To determine if the HEART score is predictive of major adverse cardiac events (MACE) and has the potential to safely reduce cardiac imaging in a cohort of patients with low-risk chest pain presenting to the ED.

**Methods:** This is a case-cohort study using prospective and retrospective data elements. Patients with MACE, defined as a composite endpoint of death, myocardial infarction, or coronary revascularization during the index visit, were identified from an ED-based Observation Unit Chest Pain Registry (OUCR). HEART scores were determined by blinded chart review, in which abstractors were unaware of the subject’s outcome (case/control assignment). As in prior studies, HEART scores were dichotomized into low-risk (three or less) and high-risk (four or more) scores (four or more). Logistic regression was used to model the relationship between heart scores and MACE. Sensitivity, specificity, and likelihood ratios were calculated. Missed ACS rate and potential cardiac imaging reduction were calculated using the entire cohort.
Results: From 1/2008-4/2010, 1070 low-risk chest pain patients were included in the OUCPR. MACE occurred in 1.1% (12/1070) of subjects in the cohort. Among cases of MACE, 58% (7/12) were high-risk by HEART score, compared to 12.5% (15/120) in controls. OR 9.8, 95% CI (2.8–34.9), P<0.0001. A HEART score of >3 was 58% sensitive, 95% CI (32–81%), 87.5% specific, 95% CI (80–92%) for MACE and had positive and negative likelihood ratios of 4.7 and 0.42. Use of the HEART score in the entire cohort would have resulted in five cases of missed ACS, a miss rate of less than 0.5% (5/1070), and potential reduction in cardiac imaging of 87.9% (941/1070).

Conclusion: A high-risk HEART score is strongly associated with MACE in a population with low pre-test probability of disease. The rate of MACE among low-risk patients with a HEART score ≤3 was less than 0.5%. If used to guide cardiac imaging, the HEART score could reduce imaging by nearly 80% in the low-risk population.

Non-adherence With Early Goal-directed Therapy Has Increased Over Time
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Background: Early goal-directed therapy (EGDT) has been shown to improve outcomes in patients with severe sepsis, yet it remains underused.

Objectives: The aim of our study was to determine whether the rate of EGDT non-adherence in the emergency department (ED) changed over time. We hypothesized that adherence with EGDT would increase over time.

Methods: Cohort study of 754 EGDT-eligible patients presenting to a single-center ED from 2005 to 2009. Patients were defined as EGDT-eligible if systolic blood pressure < 90 mm Hg after intravenous fluid resuscitation (shock subgroup) or serum lactate ≥ 4 mmol/L (non-shock subgroup). EGDT was defined as initiated if central venous oxygen saturation was measured. We used the non-parametric test for trend across years to determine whether EGDT use declined in general and by shock status.

Results: The rate of EGDT initiation significantly declined over the years (59% in 2005, 52% in 2006, 44% in 2007, 42% in 2008, and 37% in 2009, P<0.001). The rate of EGDT initiation significantly declined in the non-shock subgroup (55% in 2005, 47% in 2006, 35% in 2007, 36% in 2008, 29% in 2009, P<0.001). The rate of EGDT initiation declined in the shock subgroup, although this change did not achieve statistical significance (62% in 2005, 59% in 2006, 57% in 2007, 51% in 2008, and 48% in 2009, P=0.06).

Conclusion: We found that EGDT remained underutilized. Furthermore, adherence with initiating EGDT decreased over time. Over 5 years, implementation rates decreased by approximately 50% in those who met eligibility based on the serum lactate, rather than hemodynamic, criterion. Further study is necessary to better understand EGDT non-adherence and to design interventions to improve protocol adherence.

Diagnosing and Treating Cervicitis in the Emergency Department: How Good (or Bad) Are We?
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Background: Diagnosing Chlamydia trachomatis (CT) and Neisseria gonorrhoeae (NG) cervical infections can be difficult in the emergency department (ED) without real-time testing. Failure to diagnose and treat CT/NG can lead to long-term complications.

Objectives: We aimed to see how often providers appropriately treated patients who presented to the ED with possible CT/NG.

Methods: A retrospective chart review was performed at a single academic hospital. Female patients between the age of 15 to 60 were included who had a chief complaint that required a pelvic examination and had concurrent testing for both CT and NG. Twelve months of data were analyzed from September 2007 to August 2008. Univariate analyses of history and physical elements were done to predict the likelihood of appropriate treatment. Data were analyzed using t-tests and chi-square tests.

Results: 2457 encounters were included in this analysis. The overall prevalence for CT and/or GC was 378/2457 (15.4%). Overall, 138/378 (36.5%) who were positive for CT and/or GC were appropriately treated in the ED, while 392/2079 (18.9%) who were ultimately negative for CT and/or GC were inappropriate treated for cervicitis in the ED. Patients who were treated for cervicitis in the ED were more likely to have GC and/or CT (P=0.0001). Patients who were positive for GC alone or GC-CT were more likely to be diagnosed and treated in the ED than those with CT alone (42.3% vs 29.4%, P=0.02). Factors that decreased the likelihood of appropriately treating patients in these patients include a history of vaginal discharge or pelvic pain, presence of vaginal discharge, cervical motion tenderness, abdominal tenderness, urinary tract infection, or the presence of trichomomas (P<0.05 for all). Likewise, factors that increase the likelihood of appropriately treating patients for possible cervicitis include the presence of vaginal bleeding and being pregnant (P<0.05 for both).

Conclusion: In this study, only 36% of patients who were positive for CT and/or GC were ultimately diagnosed and treated during their initial ED evaluation and 19% of patients were overtreated who were ultimately negative for GC/CT. Patients who ultimately had NG with or without CT were more likely to be appropriately diagnosed and treated than those with CT alone. Continued efforts are needed to find surrogates markers to help providers appropriately diagnose and treat GC/CT.

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Tufts Medical Center, Boston, MA

Background: Pediatric patients in the emergency department (ED) are typically seen either by physicians trained in emergency medicine (EM), or pediatric emergency medicine (PEM) via completion of an additional residency or fellowship in pediatrics or an EM fellowship after pediatrics residency.

Objectives: This study evaluates admission rates, turnaround times (TAT), and test utilization for EM vs PEM physicians working in the same clinical environment.

Methods: A retrospective chart analysis was conducted at an academic tertiary care hospital with a pediatric ED, which is staffed with dedicated pediatric nurses and residents. In our ED, only one variable is the physician, who can either be EM- or PEM-trained. All visits for patients aged <18 yrs who presented during the time the pediatric ED was open (noon to midnight) from 7/1/07 to 6/30/10 were eligible for inclusion. Only patients seen by physicians who saw >400 visits during this time period were included. Disposition outcomes for patients who were either admitted or discharged were compared between EM and PEM physicians. Complete blood count (CBC) ordering rate was used as a surrogate for test utilization.

Results: 13,347 patient visits were eligible for inclusion, of which 8,330 (62.4%) were seen by two PEM physicians and 5,017 (37.6%) were seen by nine EM physicians. There was a difference in mean age (6.9 vs 7.1 yrs, P=0.01), though sex (53.6% vs 53.9% male, P=0.83), race (P=0.29), acuity (mean ESI 3.35 vs 3.33, P=0.99), and mode of arrival (15.9% vs 17.0% EMS transport, P=0.66) were not significantly different. Overall admission rates were similar (17.1% PEM vs 17.5% EM, P=0.50), as were critical care admissions (2.9% PEM vs 2.7% EM of total admissions, P=0.40). TATs were significantly different (146.0±2.5 minutes PEM vs 150.0±2.5 minutes PEM).
149.7±3.2 minutes EM, p = 0.04), as were CBC ordering rates (16.0% PEM vs 17.6% EM, p = 0.01).

Conclusion: In our pediatric ED, EM and PEM physicians have similar rates of admission to floor beds and critical care. However, PEM physicians are slightly faster at throughput and order fewer CBCs. Further studies are indicated to determine further differences in resource utilization, error rates, quality indicator performance, and patient satisfaction.

Quality of Care in Children With Asthma, Bronchiolitis, and Croup in a Non-children’s Hospital Emergency Department
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1University of North Carolina-Chapel Hill Dept of Emergency Medicine, Chapel Hill, NC; 2WakeMed Health & Hospitals, Raleigh, NC

Background: Respiratory illnesses are among the top diagnoses for emergency department (ED) visits, with three of the most common being asthma, bronchiolitis, and croup (ABC). Systematic reviews have led to recommendations in the care for ABC. Quality indicators (QIs) and national benchmarks (NBs) have recently been published to assist with quality improvement initiatives.

Objectives: To determine if QIs for ABC set by free-standing children’s hospitals (FSCH) were matched in nonchildren’s hospitals (NCHs) and if a pediatric emergency medicine (PEM) physician improved care for children with ABC. We hypothesized that the care of children with ABC is variable at NCH, and that the addition of a PEM physician would improve care in the community.

Methods: We conducted a 1-year chart review of all discharged patients with ABC treated at four EDs in a large urban hospital system. QIs for asthma (2–14 yrs) were number treated with steroids, antibiotics (Abx), and/or chest radiograph (X-ray); for bronchiolitis (3m-2 yrs), the number who received X-ray and/or Abx; and for croup (3m-3 yrs), the number who received steroids and/or X-ray. There were three physician groups: 1) PEM-trained physicians, 2) EM core physicians (EMCs) who commit 1/3 of their time in a children’s ED in the community (CED), and 3) EM-trained physicians (EM) who do not work in a CED. Hospital EDs were divided into CED and NCH ED. Summary percentages were calculated for physician group and hospital ED and compared to NB and FSCH.

Results: During the study period, there were 1135 asthma, 253 bronchiolitis, and 583 croup ED patient visits who were discharged home. The majority of patients were seen in a CED (77%). Care for ABC patients was provided by PEM 46%, EMC 28%, and EM 25%.

Of the seven QIs, use of steroids exceeded the NB and FSCH for ABC patients was provided by PEM 46%, EMC 28%, and EM 25%. Of the seven QIs, use of steroids exceeded the NB and FSCH for asthma and croup, regardless of training or type of ED. Use of Abx for asthma was within NB and FSCH, but use of Abx in bronchiolitis was higher for EMC and EM physicians. For all conditions, the use of X-rays was higher than the NB and FSCH (see Table 1).

Conclusion: The QIs for ABC in a large urban hospital system with a CED mirrored that of a FSCH. The overutilization of radiographs for ABC by all three physician groups should lead to a quality improvement program in the future. Finally, the introduction of PEM and/or EMC physicians into a NCH model may help meet the benchmarks set for ABC nationally.

Table 1

<table>
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40 Clinical Experience Predicts CT Utilization Rates in Lower-acuity Patients
Shawn K Dowling, Gavin Greenfield, Dongmei Wang, Eddy Lang, and Grant Innes
University of Calgary, Calgary, AB, Canada

Background: Computed tomography (CT) imaging is an increasingly used emergency department (ED) resource and a contributor to prolonged length of stay. Regional studies of utilization have demonstrated significant variability among physicians in CT imaging rates. Exploring the nature of this variability can lead to more rational CT usage.

Objectives: Our objective was to identify emergency physician (EP) characteristics associated with both high and low rates of CT use. We also sought to compare process of care outcomes such as ED length of stay, admission rates, and unexpected ED visit rates among the two groups.

Methods: This administrative database study was conducted at three primarily adult EDs over a one-year period. Every patient visit and CT image was linked to a hospital site and an individual EP. To minimize confounders and provide a more homogenous sample, only Canadian Triage and Acuity Scale (CTAS) 3 patients were included. Predictor variables included for analysis were EP age, sex, years in practice, training path (EM vs FRCP), and number of patients seen per hour. EPs were categorized into one of three groups based on their CT ordering rates (quartiles: high CT users (top 25%), control (middle 50%), and low CT users (bottom 25%).

Results: During the one-year period, 93,510 CTAS 3 patients were treated by the 115 EPs. The mean CT usage rate was 12.0%. Comparing the highest CT users (>15% CT ordering rate) to the control group, none of the following variables were predictive (odds ratio and 95% CI): age 1.01 (0.96–1.07), years in practice 1.01 (0.96–1.07), EM vs FRCP trained 0.90 (0.42–2.66), and patients seen per hour 1.39 (0.46–4.21). Comparing low CT users (<10% ordering rate) to the control group, increased age and years in practice were predictive of reduced use: age 1.08 (1.03–1.15), years in practice 1.07 (1.02–1.13). When compared to the lowest CT user group, the highest CT users had higher admission rates (20.2% vs 13.9%, p<0.001) and longer times from physician to disposition (176 minutes versus 123 minutes, p<0.001).

Conclusion: In this study, physician age and clinical experience were associated with lower CT imaging rates. EPs who ordered more CTs had higher admission rates and longer physician-to-disposition times. Further research should examine the safety dimensions of these extremes in practice patterns and better understand the rationale employed by more limited users. (Originally Submitted as a “Late-breaker”)

41 Waiting With an Emergency: Short-term Mortality and Hospital Admission Following Departure From Crowded Emergency Departments
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Background: Emergency department (ED) crowding leads to longer length of stay (LOS), delayed care, and leaving without being seen (LWBS). Patient safety initiatives have focused on reducing delays for time-sensitive treatments in acutely ill patients and on reducing LWBS, thought to represent high-risk groups. Yet the vast majority of ED patients are seen by a physician and discharged (SAD), and little is known about the safety implications of crowding for these patients.

Objectives: To determine among non-admitted ED patients whether 1) presenting during a crowded shift, or 2) LWBS are associated with the risk of death or hospitalization within seven days of ED departure.
Methods: Observational, population-based, using health administrative databases to identify non-admitted ED patients in 2003–2008 at higher volume hospitals in Ontario, Canada. For each patient, we determined departure status (SAD vs. LWBS) and shift crowdedness (calculated as the mean ED LOS among all patients in the same ED/day/shift/triage-acuity group). Covariates included age, sex, chief complaint, prior ED visits, socio-economic status, hospital type, ED volume, rurality, weekday, time of day, and month. We used generalized estimating equations (GEE) to account for clustering within EDs with the patient as the unit of analysis.

Results: There were 13,934,542 SAD and 617,011 LWBS patients over 5 years (90% of all ED patients). Among high-acuity patients, the crude rate of 7-day death or hospitalization increased from 2.3% to 3.1% for patients seen during shifts with a mean ED LOS <1 hour vs. >4 hours, respectively; the respective increase among low-acuity patients was from 0.7% to 1.3%. The risk increased with increasing shift crowdedness (high acuity patients: adjusted odds ratio [aOR] death 1.48, 95% CI 1.13–1.95 and aOR hospitalization 1.75 95% CI 1.62–1.89; low-acuity patients aOR death 2.11, 95% CI 1.45–3.08 and aOR hospitalization 1.86 95% CI 1.74–2.00) for mean EDLOS 6+ vs. <1 hour. LWBS was not associated with higher risk of adverse events.

Conclusion: Presenting to a more crowded ED is associated with a greater risk of short-term death and hospitalization in patients who are well enough to leave the ED. LWBS patients are not at higher risk of short-term adverse events. Patient safety efforts should target overall ED LOS reductions, since the adverse effects of crowding extend to patients usually thought of as low-risk.

42 Pediatric Prescribing Errors: The Effect of an Educational Based Intervention on Prescription Errors Among Emergency Medicine Residents
Melissa Zukowski, Jenny Mendelson, Asad Patanwala, Roger Bentley, Karen Saks, and Dale Woolridge
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Background: Prescription errors are a major source of potential morbidity and mortality, and efforts to reduce them are urgently needed. Most error reduction efforts have focused on adults; however, a handful of published pediatric studies have shown error rates as high as 59%, suggesting interventions for children are also needed.

Objectives: Our hypothesis was that a combination of a focused problem-based lecture directed to emergency medicine (EM) residents and the application of a dose calculation tool would significantly reduce pediatric prescription dosing errors by EM residents in a busy emergency department (ED).

Methods: A didactic session on pediatric prescription error reduction was given to EM residents in the summer of 2009, along with a dose calculation tool targeting the most commonly written outpatient medications. Data were collected from discharge prescriptions for two months each from fall 2008 (pre-intervention) and fall 2009 (post-intervention) for all prescriptions written for children aged 1 day to 12 years old, and 600 patients were randomly reviewed for each period. Medication errors were identified with the use of a common pediatric dosing reference guide using a threshold of >10% above or below accepted dosing ranges by weight.

Results: There were 170 pre-intervention and 264 post-intervention prescriptions. The overall error rate in the pre-intervention group was 29.4% compared to 21.6% in the post-intervention group (p=0.069). There was an 18.9% reduction in antipyretic dosing errors (25.4% to 6.5%) from pre to post-intervention (p<0.001). Errors were most common for antibiotics, sedative/analgesics, and antipyretic medications.

Conclusion: Our study found that pediatric medication errors are common in a busy ED setting, and that targeted education coupled with a dose calculation tool was associated with a significant reduction in pediatric outpatient prescription errors. Continued efforts are needed to reduce prescription errors in children.

43 Current Opinions of Patient Handovers in the Emergency Department From Emergency Medical Services to Emergency Department Staff
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Background: Patient handovers have been scrutinized in recent years as a target for improving patient care and decreasing medical errors. Nurse-to-nurse and physician-to-physician handovers have been studied, and strategies for improvement have been described. However, the current literature on ED-based patient handovers is sparse. Emergency medical services to emergency department (EMS-to-ED) handovers are the subject of a few small studies abroad, but to our knowledge have not been studied in the United States. These handovers have significant implications for patient care.

Objectives: To assess perceptions among EMS and ED personnel of the quality of EMS-to-ED handovers for acute conditions in a U.S. medical system.

Methods: This study was performed at an urban academic medical center with a private EMS service. A survey was developed based on previously published models to evaluate impressions of the quality of handovers in the ED between EMS and ED staff. Respondents were asked to report whether they were trained for such handovers, and to assess the quality of handovers in various acute clinical scenarios. The online survey was anonymously administered to ED attending physicians, residents, and full-time EMS staff (n=42) in July 2010.

Results: Survey results show that 89% of EMS staff but only 19% of ED physicians have had any formal training in patient handovers (p<0.01). While 60% of both groups felt EMS has enough time to give an adequate handover, only 50% of physicians felt they pay adequate attention to handovers. Eighty-two percent of all respondents felt there was variability in the quality of handovers dependent on EMS crew. Significant differences in responses were found in perceived quality of handovers in several clinical scenarios, with EMS more commonly feeling that a complete handover was given. These include stroke (99% v 67%, EMS v ED), cardiac arrest (98% v 69%), myocardial infarction (99% v 74%), respiratory distress (89% v 50%), and unresponsive patients (89% v 28%) (all p<0.01). There was no difference in trauma (78% v 67%).

Conclusion: There is a significant disparity in the perceived quality of handovers between EMS and ED staff, highlighting the need for research into methods for improving the quality of these handovers. Areas of attention should include focusing information provided by EMS to the particular information required by the ED, as well as improving reception of this information by ED staff.

44 Impact of Having a Pharmacist in the Emergency Department and Medication Errors
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Background: Medication errors are believed to be common in emergency departments (ED). However, in spite of efforts to collect more and better data, the majority of medication errors continue to go unreported. Computerized provider order entry is one tool that is widely used in EDs to minimize transcription and
computing errors. Intensive care unit based pharmacists are commonly employed and proven to reduce medication error. However, they are infrequently employed in the ED. The work environment in a busy ED is particularly conducive to distractions and interruptions, making it ideal for a safety intervention.

**Objectives:** To reduce medication errors by utilization of a pharmacist in the ED of a pediatric tertiary care hospital.

**Methods:** Review of pharmacy interventions reported before and after introduction of a pharmacist in the ED, review of patient safety learning reports, and survey of ED providers and nurses.

**Results:** The pharmacist was introduced in the ED in August 2008 during the busiest shift (1400 - 2400 hours), 7 days a week, in this urban children's hospital with about 44,000 ED patient visits per year. This children’s hospital has taken a firm stand on patient safety and encourages staff to document any errors, misses, or near misses and safety reports. Pharmacist intervention data were abstracted 17 months prior to and 17 months after introduction of the pharmacist in the ED. There was a significant difference in the number of interventions: 159 in the preceding months and 705 in the staffed months (see attached Chart, average 8.39 per month pre-pharmacist to 41.47 per month post-pharmacist). The most common interventions included allergy alert, overdose, under-dose, drug interactions, drug information, and therapeutic consult. This reflects total interventions, which potentially go un-documented. Also, hospital safety learning reports pertaining to medications in the ED were reviewed. There were nine reports pre-pharmacist and 25 post-pharmacist, indicating higher reporting of near-miss events. An ED provider survey showed an overwhelmingly positive response to having a pharmacist in the ED. Pharmacist rotation data were abstracted 17 months prior to and 17 months after introduction of the pharmacist in the ED. There was a significant difference in the number of interventions: 159 in the preceding months and 705 in the staffed months (see attached Chart, average 8.39 per month pre-pharmacist to 41.47 per month post-pharmacist). The most common interventions included allergy alert, overdose, under-dose, drug interactions, drug information, and therapeutic consult. This reflects total interventions, which potentially go un-documented. Also, hospital safety learning reports pertaining to medications in the ED were reviewed. There were nine reports pre-pharmacist and 25 post-pharmacist, indicating higher reporting of near-miss events. An ED provider survey showed an overwhelmingly positive response to having a pharmacist in the ED.

**Conclusion:** A pharmacist in the ED is a positive step towards reducing medication errors.
models were developed with the University of Michigan simulation center for procedural training. Twenty physicians, including the first Ghanaian EM resident class, completed the course over 5 days in Oct 2009. Knowledge was tested pre- and post-course with a 50-question multiple choice question (MCQ) exam. Procedural skills were tested pre- and post-course using standard simulation measures. An observed clinical scenario was administered to measure overall proficiency at trauma management. A satisfaction and applicability survey was administered in order to tailor future course modifications.

Results: All participants (n=20) demonstrated significant improvement in MCQ score (p <.0001) (pre-test = 49.97% ± 7.86; post-test = 77.44% ± 7.91). Clinical skills were tested for RSI, cricothyroidotomy, tube thoracostomy, and pericardiocentesis with significant improvement (p <.05) in 25 of 39 skills measures tested. All participants who completed the course demonstrated proficiency (n = 10) or mastery (n=5) of a clinical scenario. Participants rated trauma training as valuable and applicable to their clinical practice but suggested future AETC modifications, including greater emphasis on basic trauma management skills and longer course period with fewer topics covered daily.

Conclusion: The AETC course improved provider knowledge about management of injured patients and improved clinical skills for commonly performed procedures. More study is needed to determine if trainees have translated improved knowledge into clinical practice.

47 Medical Education Emergency Relief in Southern Sudan: An Innovative, Collaborative Model
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Background: There is a severe shortage of qualified medical faculty instructors in Southern Sudan. The University of Juba has the only College of Medicine in the entire region. Given the humanitarian crisis, examining importing U.S. medical students as foreign medical faculty to fill gaps in pre-clinical education is needed.

Objectives: Implement and assess the Southern Sudan Medical Education Collaborative (SSMEC), a novel multi-institution humanitarian initiative led by the Massachusetts General Hospital Division of Global Health & Human Rights (GHHR), Department of Emergency Medicine.

Methods: We use research case study methods to describe the chronology of SSMEC and key milestones, operational challenges, and outcomes. Source data include notes from SSMEC planning meetings in 2009 and 2010, project planning documents, e-mails, and MOUs; data were coded thematically. We administered anonymous course evaluations. Students were asked to provide scores on SSMEC-led tutorial groups, lectures, independent reading, and grand rounds (1-10 scale, 10 as “very useful”), related to perceptions of usefulness. We calculated mean scores and standard deviations.

Results: To date, SSMEC has deployed 10 instructors from four institutions (Massachusetts General Hospital, Harvard Medical School, Johns Hopkins, University of Nairobi, and Albany Medical College) who have collectively taught 94 person-weeks. SSMEC instructors taught courses in functional anatomy, biochemistry, neuroscience, histology, physiology, clinical skills, embryology, and community medicine. Teaching modalities included lectures, case-based learning, role playing, team based learning, anatomy dissection, and tutorials. Students rated the histology course accordingly: 7.6 +/-2.6 (mean +/- SD) for tutorial groups; 8.5 +/-2.6 for lectures; 7.4 +/- 2.7 for grand rounds. Students rated the physiology course accordingly: 8.5 +/- 1.9 tutorial groups; 8.8 +/-1.5 for lectures; and 8.7 +/- 1.8 for grand rounds.

Conclusion: The initial phase of SSMEC shows considerable promise. While an emergency relief effort, future directions include establishment of a faculty development track to work toward local control of quality sustainable medical education. Such activities may provide insights into a model for medical education in other post-conflict areas.

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Background: In July 2009, the Medical Council of India (MCI) recognized emergency medicine (EM) as a specialty. Over the past decade, various postgraduate EM training programs have emerged in India despite the lack of formal recognition of the field. Not much is known about the content of these training programs.

Objectives: To assess the duration, level of training, certification requirements, and hospital demographics for each Indian postgraduate EM training program identified as of March 2010.

Methods: This study used a descriptive survey tool to collect data from EM residency program directors (PDs) throughout India. PDs were identified using an online registry. They were contacted by study investigators via e-mail, phone, or in-person interviews at an international conference on EM in India. Published data on each of the programs were also used to collect data on the training programs.

Results: Sixteen training programs that lead to an EM certification in 13 different hospitals were identified. All of the programs were associated with private institutions. Programs varied in length from 1 to 3 years. Some programs were affiliated with foreign institutions in the United Kingdom and the United States. The 1-year-long programs that are not affiliated with foreign institutions have the least patient volume and prehospital care. The programs that are affiliated with foreign institutions have the most teaching faculty with formal EM training. Didactic teaching varied between 4 and 9 hours per week and ED volumes varied between 50 and 200 patients per day. Of note, a government-sponsored EM residency started after the completion of the survey.

Conclusion: The national recognition of EM as a specialty in India is an important step towards development. Because many programs were started before the specialty was recognized, there is a large amount of variation among programs. Standardizing training will be a vital step for the growth of the specialty in India and ensuring quality training programs.

49 Worldwide Growth of Emergency Medicine as a Recognized Medical Specialty
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Background: Emergency medicine (EM) was first recognized as a medical specialty in the United Kingdom in 1972, in the United States in 1979, and in a growing number of countries since then;
however, the full extent to which EM has been recognized as a specialty worldwide remains unknown.

**Objectives:** To describe the worldwide growth to date of EM as a recognized medical specialty.

**Methods:** Countries were included if we could document the year in which EM was recognized as either a primary specialty or as a secondary specialty (sub- or super-specialty) by the relevant governmental or designated national non-governmental body responsible for recognizing medical specialties in that country. Countries with only EM training programs, supplemental certifications in EM for physicians from other recognized specialties, or where we could not document the year of specialty recognition, were excluded. Local definitions for an EM specialty were accepted as long as the primary focus was on the initial management of all types of acutely ill and injured patients. Accepted forms of documentation included, in decreasing order of preference, governmental announcements, published journal articles, governmental or national EM society websites, American College of Emergency Physicians (ACEP) Ambassador reports, and personal communications from local experts. Medline searches based on the search terms “emergency medicine” and the name of the country of interest were conducted to identify articles that were then hand-searched for references to the date of EM recognition.

**Results:** As of October 2010, there are 62 of 192 countries in the world where EM is formally recognized as either a primary or secondary medical specialty. The growth curve for this trend is shown in Figure 1.

**Conclusion:** Since the early 1970s, EM has been formally recognized as a medical specialty in a growing number of countries throughout the world. EM is now a recognized medical specialty in countries on every continent.

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**50** Updated Assessment of US-based International Emergency Medicine and Global Health Fellowships
Steven M Andescavage, Katherine Douglass, and Ryan Abegglen
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**Background:** The emergency medicine (EM) fellowships of international emergency medicine (IEM) and global health (GH) have continued to grow since their inception in the mid 1990s. A handful of IEM fellowships surfaced prior to 2000, and by 2005 a total of eight IEM fellowship programs were established. To our knowledge, no data have been collected since that time.

**Objectives:** To determine the current status of IEM and GH fellowships available to EM residency graduates.

**Methods:** From October 2009 to February 2010, an IRB-approved survey was distributed online to all EM program directors listed on the Accreditation Council of Graduate Medical Education and American Osteopathic Association websites. A trained research assistant collected additional data via direct phone calls.

**Results:** Of the 69 respondents of the survey, 18 EM programs confirmed current IEM or GH fellowships (26%). Two programs answered ‘yes’ to having a fellowship, but did not complete the survey questions and were not included in further analysis. Fifteen of 16 fellowships (93.4%) offer an advanced degree (e.g., MPH, MS, MSPH). Ten of 16 fellowships (62.5%) have produced academic presentations and publications within the last 3 years. Fellowships spend a range between 4 to 26 weeks annually in the field. Nine of 16 fellowships (56.3%) offer observational rotations for foreign-trained medical doctors. Of the 53 programs that did not have an IEM/GH fellowship, five responded ‘highly likely’ to have an IEM/GH fellowship within the next 3 years, and two responded ‘likely’ to have a fellowship within 3 years. Forty of the programs without IEM/GH fellowships have at least one faculty member involved with international projects and offer residents the opportunity for international elective rotations.

**Limitations:** Of the 197 programs contacted, only 69 responded. It is likely that some departments with IEM/GH fellowship programs did not respond. Furthermore, it is possible that the responding programs are more likely to have faculty or resident involvement in international activities.

**Conclusion:** The field of IEM/GH continues to grow with time. Even in EM programs that do not have an IEM/GH fellowship, many EM residency programs have faculty members active in international projects and offer international rotations to EM residents.

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**51** Can Paramedics Accurately Diagnose Sepsis and Severe Sepsis in the Field?
Autumn Erwin, Joshua Salzman, Sandi Wewerka, Aaron Burnett, and Ralph J. Frascone
*Regions Hospital, Oakdale, MN*

**Background:** Morbidity and mortality from sepsis and severe sepsis is a significant problem, with early recognition and treatment as areas of focus. Little work has been done to examine the ability of prehospital providers to identify sepsis and severe sepsis.

**Objectives:** Determine the accuracy of paramedic diagnosis of sepsis and severe sepsis using a diagnostic screening tool and point of care (POC) lactate measurement.

**Methods:** Following IRB approval, consented paramedics from a single, advanced life support (ALS) dual-role emergency medical services (EMS) agency underwent a one-hour training session on the universal criteria for sepsis diagnosis and the use of a POC lactate meter. Paramedics then screened every patient transported from three local nursing homes and assigned them a diagnosis of no sepsis, sepsis, or severe sepsis. The screening tool defined sepsis as an identified or suspected infection plus two of the following: temperature < 96.8 or >100.4°F, heart rate > 90/min, respiratory rate > 20/min, or altered mental status. Severe sepsis was defined as meeting the sepsis criteria, as well as one of the following: mottled skin, capillary refill > 3 seconds, lactate > 2mmol/L, or abrupt changes in mental status. Patient charts were abstracted and a blinded physician assigned a final diagnosis to each patient. Sensitivity, specificity, negative and positive predictive values, and Cohen’s kappa were used to evaluate the agreement between the paramedic and physician diagnosis.

**Results:** One hundred and fifty-one patients were screened between October 2009 and February 2010, and 96 cases (64%) had both a paramedic and independent physician diagnosis assigned. Sensitivity, specificity, negative predictive value, and positive predictive value for sepsis diagnosis were 0.33 (95% CI 0.18, 0.53), 0.89 (95% CI 0.80, 0.94), 0.8 (95% CI 0.70, 0.87), and 0.5 (95% CI 0.28, 0.72). Sensitivity, specificity, negative predictive value, and positive predictive value for severe sepsis diagnosis were 0.20 (95% CI 0.05, 0.51), 0.94 (95% CI 0.87, 0.97), 0.91 (95% CI 0.83, 0.95), and 0.29 (95% CI 0.08, 0.64). The level of agreement between paramedic and physician diagnosis of sepsis and severe sepsis was low (kappa = 0.25 and 0.16, respectively).
Conclusion: Paramedics were able to accurately identify patients not experiencing sepsis or severe sepsis, but were not able to identify those with sepsis or severe sepsis with high sensitivity.

52 Can Paramedics Accurately Activate a Cardiac Catheterization Laboratory for Acute Myocardial Infarction? A Pilot Study
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Background: Time is critical to myocardial salvage and functional improvement in the setting of acute ST elevation myocardial infarction (STEMI). The use of a prehospital electrocardiogram (ECG) for pre-arrival activation of the cardiac catheterization laboratory (CCL) has been highly recommended. Recently, some emergency medical services (EMS) systems have allowed paramedic-initiated activation of the CCL rather than transmission of an ECG to a physician.

Objectives: Our goal was to determine the accuracy of paramedics in predicting appropriate CCL for STEMI.

Methods: The study prehospital system is a medium-size EMS agency with paramedics and EMTs. Data were collected from April 2009-October 2010. Although paramedics did not directly activate the CCL, they contacted a designated hotline if there were ECG findings suspicious for STEMI. A database was created which included (1) date and time, (2) patient demographics, (3) whether the paramedic believed CCL activation was appropriate, and (4) whether the CCL was actually activated for that patient.

Results: The paramedics called the hotline for 29 patients. Their belief was correct 15 times, incorrect 7 times, and 7 times unable to make a determination. Twenty-nine patients were subsequently transported to the hospital. Of those, 14 were found to have STEMI, 13 were not (one patient died), and two were indeterminate.

Conclusion: Our study showed that paramedics were able to accurately identify patients with STEMI at the 95% CI level. However, the number of patients is too small to draw conclusions about the overall accuracy.

54 Can Therapeutic Hypothermia for Post-cardiac Arrest Patients Be Successfully Initiated in the Prehospital Environment by the Clinical Providers of a Rural Air Medical Service?
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Background: A subgroup of survivors of cardiac arrest can achieve improved neurological outcomes if therapeutic hypothermia (TH) is quickly instituted. Many of these patients are ultimately transferred to centers that are properly staffed and equipped to provide this newer modality of care. There is increasing interest in initiating TH in the prehospital setting in order to expedite core cooling.

Objectives: We sought to determine if effective prehospital TH could be achieved by a rural air medical transport service (AMTS) for the post cardiac arrest population.

Methods: Inclusion criteria included age 18–85 years; witnessed cardiac arrest; return of spontaneous circulation from ventricular tachycardia, ventricular fibrillation or pulseless electrical activity; endotracheal intubation; and systolic blood pressure of >= 90 mmHg. Therapeutic intervention: 30 ml/kg of 4 degrees C lactated Ringers to a maximum of two liters for a goal temperature of 33 degrees C maintained for 24 hours.

Results: From 6/08-9/09, thirty-one patients were enrolled: 28 with ventricular fibrillation/tachycardia, and 3 with pulseless electrical activity. Cardiac arrest duration ranged from 2 minutes to 3 hours. The mean age was 60 years, with 65% male. The average fluid volume infused was 1600 cc, and the mean core temperature at the receiving hospital was 34.5°C. Nineteen patients underwent emergent primary coronary intervention and six received thrombolytic therapy. There were 13 documented STE-MIs. Thirteen patients (42%) were discharged with full neurological recovery, four (13%) with partial neurological recovery, and 14 (45%) expired during the hospitalization.

Conclusion: The ability to initiate TH in the prehospital setting is possible, but requires specialized training and equipment.
Conclusion: In this rural AMTS, we have demonstrated that successful prehospital initiation of TH with cold lactated Ringers infusion for survivors of cardiac arrest is feasible. In addition, important therapeutic interventions can be initiated or continued during transport by skilled providers. The observed rate of patients recovering full neurological function is promising and compares favorably to national studies. A comprehensive, coordinated, and monitored quality plan will be required to consistently achieve timely target core temperatures.

Background: Emergency department (ED) overcrowding is a complex issue and triage nurse ordering (TNO) is a potential intervention to mitigate this problem.

Objectives: To examine the effectiveness of TNO in mitigating emergency department (ED) overcrowding.

Methods: Electronic databases (Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, Web of Science®, HealthSTAR, Dissertation Abstracts, ABI/INFORM Global), controlled trial registry websites, conference proceedings, study references, experts in the field, and correspondence with authors were used to identify potentially relevant studies. Interventional studies in which TNO was used to influence ED overcrowding metrics (length of stay [LOS] and physician-initial-assessment [PIA]) were included in the review. Two reviewers independently assessed the study eligibility and methodological quality. Mean differences (MD) were calculated and reported with corresponding 95% confidence intervals (CI).

Results: From 14,446 potential relevant studies, six were included in the systematic review. The majority were single-center ED studies; the overall quality was rated as weak due to methodological deficiencies and poor outcome reporting. TNO was associated with a 37-minute mean reduction (95% CI; –44.10 to –30.30) in the overall ED LOS in one randomized clinical trial (RCT); a 49-minute mean reduction (95% CI; –60.38 to –37.04) was observed in non-RCTs. When applied to injured subjects with a suspicion of fracture, TNO interventions reduced ED LOS by 26 min (95% CI; –47.72 to –4.21) in two RCTs and by 14 min (95% CI; –19.53 to –8.18) in two non-RCTs. A non-significant reduction in PIA was observed in two RCTs. A significant reduction in PIA in non-RCTs was observed in two RCTs.

Conclusion: Overall, TNO appears to be an effective intervention to reduce ED LOS especially in injury and/or rule-out fracture cases. When applied to injured subjects with a suspicion of fracture, TNO can reduce ED LOS by 26 minutes, and PIA by 14 minutes. These results are promising and suggest that TNO is an effective intervention to mitigate ED overcrowding.

Background: Emergency department (ED) triage serves to quickly assess patient risk based on acuity of presentation. Inefficiencies that delay access to medical services affect satisfaction and quality of care.

Objectives: To develop an ED simulation triage model and evaluate various managerial scenarios for reducing patient wait times.

Methods: A time-motion study was undertaken in 2008 for 15 weeks in the triage area of a university tertiary care hospital ED with an annual census of 66,315 visits. Observers recorded triage duration, and personnel in triage. In addition, arrival times, socio-demographic data, and triage severity were extracted from the ED administrative database. Simulation models with an added optimization component were developed using ARENA simulation software.

Results: Data on 3205 walk-in and 537 ambulance patients were collected. Analysis showed significant differences between the waiting times incurred by the ambulance versus walk-in patients (3.6 min versus 19.3 min on average). The triage simulation model was validated based on one full-time triage nurse (RN) and a second RN being available for about 5 hours throughout the day. Simulated scenarios designed to understand the best way to utilize a second full-time RN showed that when one RN is dedicated to ambulance arrivals and the other to walk-in patients, the ambulance wait times can be reduced to 1.5 min, while walk-in patients wait significantly longer (44.10 min). A follow-up scenario showed that it is possible to reduce the walk-in patient wait time to approximately 9 min by implementing a quick (0.5–1 min) pre-triage in order to screen for patients requiring ambulatory care. Lastly, the scenario with the most optimal outcome showed that the shortest wait times are achieved when both RNs are simultaneously responsible for ambulance, walk-in patients, and pre-triage. Through this strategy, wait times can be reduced to 0.68 min for ambulances and 2.25 min for walk-in patients. The standard deviation of the wait times is also significantly reduced under this scenario.

Conclusion: Simulation methodology allows for testing of various ED triage process scenarios and makes it possible to evaluate the effect of a number of alternatives without disrupting ED triage operations. This process facilitates managers to make informed decisions about system operational efficiency.

Background: Critical information is obtained at triage and used to determine a patient’s acuity, including chief complaint, temperature, pulse, blood pressure, respirations, and pulse oximetry. Many of these vital signs have been shown to correlate with disposition from the emergency department (ED). A pain score using an analog pain scale is usually included in the triage process and has been described as the “fifth vital sign”. However, the relationship between pain score and ED disposition has not been established.

Objectives: We hypothesize that triage pain score does not correlate with disposition from the ED.

Methods: We performed a retrospective chart review for 1,197 consecutive patients over 8 consecutive days at a Level I urban, academic ED with an annual census of 55,000. Triage vital signs, initial pain scores, and disposition from the ED for each patient were abstracted from the medical record. Eighty-seven patients were excluded secondary to incomplete charts. Triage pain scores were stratified into groups for analysis as has been used in other studies: 0, 1–3, 4–6, 7–9, 10 or greater. The outcome of interest was hospital admission. We report admission rates with 95% confidence intervals (CIs), and compare rates using Fisher’s exact test with a Bonferroni penalty for multiple comparisons.
58 Does the Use of Physician Triage of Patients Arriving by Ambulance Improve Time to Provider and ED Length of Stay?
Kathryn Voiz1, Scarlet Reichenbach , Christopher Fischer1, Leon Sanchez1, Daniel McGillicuddy3, and Jason Imperato MD2
1BIDMC, Boston, MA; 2Mount Auburn Hospital, Cambridge, MA

Background: Studies have suggested that patients arriving to the emergency department (ED) via ambulance have longer length of stays than patients not arriving by ambulance, and that length of stay of all patients increases when more patients arrive via ambulance.

Objectives: To determine whether resident physician triage of patients arriving by ambulance improves time to provider and ED length of stay (LOS).

Methods: A retrospective cohort study was conducted of patients at an urban ED with over 30,000 annual visits. Mode of arrival (ambulance, private vehicle, or walk-in), time to attending physician, and ED LOS were abstracted from the medical record for all ED patients for 2 months before and 2 months after initiation of an ambulance triage resident physician (ATR). The ambulance triage system involved a resident physician already working at the ED who attempted to meet all ambulances arriving in the ED. From the Table for details. The highest and lowest categories had a higher rate of admission. Future studies should investigate the etiology of this finding, as well as to adjust for other important covariates. (Originally Submitted as a "Late-breaker")

Results: There were 1,095 patients in the study with a mean age of 48.7 +/- 20.5, with 54% females. The mean pain score was 4.1 +/- 3.7, and 482 (36%) patients were admitted. The mean pain score for admitted patients was 3.7 (95% CI 3.3 - 4.1) vs. 4.4 (4.1 - 4.6) in those discharged. Interestingly, there was a U-shaped distribution with 43% (170/391, 40-48%) admitted if pain score = 0; 31% (193/623, 28-35%) for pain score 2-9; and 41% (39/96, 31-51%) for pain score > 10 (see the Table for details). Both the no pain and highest pain groups above had significantly higher rates of admission than the middle pain group (p<0.001).

Conclusion: We found a U-shaped association between pain score and admission rate. The highest and lowest categories had a higher rate of admission. Future studies should investigate the etiology of this finding, as well as to adjust for other important covariates. (Originally Submitted as a "Late-breaker")

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59 PsySTART Rapid Disaster Mental Health Triage System: Performance During a Full Scale Terrorism Exercise in Los Angeles County Hospitals
Merritt Schreiber1, Kristi L Koenig1, Carl Schultz1, Sandra Shields2, and Darlene Bradley1
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Background: Efficient management of disasters includes the management of psychological casualties. The PsySTART rapid disaster mental health triage system was developed and validated for use in identifying disaster victims suffering significant psychological stress and uses a descending color tag acuity system from highest (purple) to lowest (green).

Objectives: Evaluate disaster mental health triage accuracy in a disaster exercise using the PsySTART system.

Methods: The Los Angeles County Emergency Medical Services Agency conducted a full scale exercise that included 60 simulated disaster patients from a hypothetical terrorism attack involving multiple improvised explosive devices. Each participating hospital and community clinic (n=44) responded to the 60 patients during the same three-hour period. Providers at each facility had been previously trained in the PsySTART methodology. The patient scenario indicated subjects’ ages and presenting complaints. Each hospital completed a PsySTART triage tag on simulated patients. Triage accuracy was calculated by comparing each PsySTART tag recorded from participating hospitals (n=1,378) against the correct answers for each of the 60 case scenarios. Accuracy was assessed by participating hospital, and averaged for all hospitals in the entire county.

Results: Among the 44 participating facilities, overall triage accuracy was 90.3% (95% CI 89.0 - 91.6) for all cases. Triage accuracy for the purple, red, yellow, and green categories was 99.7% (95% CI 99.1 - 1.0), 88.5% (95% CI 86.9 - 90.1), 94.0% (95% CI 92.5 - 95.3), and 80.7% (95% CI 73.9 - 86.2), respectively. Triage accuracy for “red” category sub-components were: loss of loved ones 96.7%; panic/threat 76.1%; event-related injury 82.7%; and loss of home 99.2%. Composite accuracy for the 20 PsySTART triage variables ranged from 73-99%.

Conclusion: Overall, the PsySTART rapid disaster mental health triage algorithm was efficient and accurate in identifying victims with low to high psychological acuity during a simulated terrorism attack with multiple improvised explosive devices. Additional provider training in identification of extreme panic indicators appears indicated. The PsySTART triage system can assist health care workers in rapidly identifying which patients may benefit from acute psychological intervention.
Background: The Canadian Triage and Acuity Scale (CTAS) is a five-level triage tool constructed from a consensus of experts and is universally used in Canada.

Objectives: The aim of the study was to measure the inter-rater agreement of nurses assigning triage levels using the CTAS to children (0–18 years old) visiting multiple pediatric emergency departments (EDs) across Canada in 2009–2010. In each setting, a research nurse performed one recruitment of 1000 patients would provide at least 50 participants to evaluate length of stay in the ED among the different triage levels. Based on a pilot study, it was estimated that the recruitment of 1000 patients would provide a 95% confidence interval for linear weighted kappa of ±0.05.

Results: A total of 1411 patients were approached, and 1313 patients were recruited and included in the final analysis. Hospitalization proportion was of 36% for patients triaged at Level 2, 9.0% at Level 3, 2.4% at Level 4, and no admittance for patients triaged at level 5 (chi-square 130.8, DOF 3; p< 0.001). There was also a strong association between triage levels and use of any medical resources (chi-square 69.5, DOF 3; p< 0.001) and length of stay (p< 0.001).

Conclusion: The CTAS demonstrates good inter-rater agreement between nurses assigning triage level to children presenting to multiple pediatric EDs.

(Originally Submitted as a “Late-breaker"

<table>
<thead>
<tr>
<th>Triage Level Assigned by the Research Nurse (Horizontal) vs Regular Nurse (Vertical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
</tr>
<tr>
<td>Level 2</td>
</tr>
<tr>
<td>Level 3</td>
</tr>
<tr>
<td>Level 4</td>
</tr>
<tr>
<td>Level 5</td>
</tr>
</tbody>
</table>

Outcomes for the Different Triage Levels

<table>
<thead>
<tr>
<th>Triage level</th>
<th>n</th>
<th>Admission (%)</th>
<th>Use of resources (%)</th>
<th>LOS in hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>level 2</td>
<td>83</td>
<td>30 (0.36)</td>
<td>64 (0.77)</td>
<td>4.8</td>
</tr>
<tr>
<td>level 3</td>
<td>560</td>
<td>50 (0.09)</td>
<td>341 (0.61)</td>
<td>3.6</td>
</tr>
<tr>
<td>level 4</td>
<td>626</td>
<td>15 (0.02)</td>
<td>267 (0.43)</td>
<td>2.6</td>
</tr>
<tr>
<td>level 5</td>
<td>44</td>
<td>0</td>
<td>13 (0.30)</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>1313</td>
<td>95 (0.07)</td>
<td>685 (0.52)</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Background: Early goal-directed therapy (EGDT) has been shown to significantly decrease mortality. Early identification of septic patients can often be challenging, which can delay appropriate targeted management. To improve detection of septic patients presenting to the emergency department (ED), we implemented a triage screening tool.

Objectives: Our study sought to determine the effect of this tool on antibiotics before and after its implementation.

Methods: This pre-post study was conducted at the ED of a tertiary teaching hospital in Montreal. Patients in both the pre and post-triage tool cohorts were identified by review of admission diagnosis and diagnosis on ED death certificate for a one year period before and after introduction of the triage tool. Completed sepsis triage screening tools were also used to identify patients in the post-triage cohort. Patients who met the criteria for severe sepsis or septic shock (suspected infection with three or more systemic inflammatory response syndrome [SIRS] criteria) were identified and their charts reviewed by trained chart reviewers to determine the length of time between triage and administration of antibiotics. Multiple linear regression analysis was conducted to evaluate the effect of the triage tool while controlling the effect of level of triage acuity, as defined in triage by nurses using the Canadian Triage and Acuity Scale (CTAS).

Results: We identified 185 patients with severe sepsis or septic shock in the pre-triage tool implementation group and 170 patients in the post-triage tool implementation group. The mean time to antibiotics for patients with CTAS Levels 1-2, the time to antibiotics decreased 101 mins (95% CI 63–139, p<0.0001) versus patients with CTAS 3-5.

Conclusion: The use of a sepsis triage screening tool significantly decreased the mean time to antibiotics in patients presenting to the ED who met criteria for severe sepsis or septic shock.

Background: As use of fast tracks, mid-level providers, and nurses ordering tests from triage increases to handle increasing emergency department (ED) volume, Emergency Severity Index (ESI) three patients present a particular problem for these accelerated systems. Some ESI 3 patients are more consistent with high-risk/high-utilizers (ESI 4), and would be appropriately managed in accelerated systems. However, other patients are more consistent with high-risk/high-utilizers (ESI 2), and placing these patients into accelerated systems may put the patient at risk, or unacceptable impede flow of the system, and would be better managed with traditional ED care. With nearly half of patients presenting to the ED in 2008 triaged at ESI 3, this patient set should be considered for an accelerated ED stay. Proper selection of ESI 3 patients remains a problem. Defining characteristics that significantly factor into admission rates and ED treatment time may be beneficial in determining patient suitability.

Objectives: To determine which ESI 3 patient entry factors are associated with admission or longer ED length of stay.

Methods: Data were drawn from the 2008 National Hospital Ambulatory Medical Care Survey (NHAMCS). Entry characteristics (age, ambulance arrival, nursing home patient, pain level, return visit, injury) and presence of one of the top 20 chief complaints on entry were regressed against ED discharge and treatment time, adjusted for race, sex, and insurance status.

Results: 13,335 ESI 3 patients were found.

Conclusion: There are entry characteristics and chief complaints in ESI 3 patients that can predict discharge and time treated in ED. These data can be used to assist proper placement of ESI 3 patients into accelerated versus traditional ED care.

### Predictive Ability of Demographic Characteristics

<table>
<thead>
<tr>
<th>Entry</th>
<th>OR discharge</th>
<th>Mins treated</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>0.97 (0.97–0.97)</td>
<td>0.99±0</td>
<td></td>
</tr>
<tr>
<td>Ambulance</td>
<td>0.42 (0.37–0.47)</td>
<td>70.96±0.08</td>
<td></td>
</tr>
<tr>
<td>Pain Level</td>
<td>NS</td>
<td>5.54±0.03</td>
<td></td>
</tr>
<tr>
<td>72h Return</td>
<td>1.47 (1.1–1.97)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Follow-up</td>
<td>0.46 (0.38–0.55)</td>
<td>20.52±0.11</td>
<td></td>
</tr>
<tr>
<td>Injury</td>
<td>1.82 (1.59–2.09)</td>
<td>24.28±0.07</td>
<td></td>
</tr>
</tbody>
</table>

### Predictive Ability of Chief Complaint Category

<table>
<thead>
<tr>
<th>Complaint</th>
<th>OR discharge</th>
<th>Mins treated</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abd. Pain</td>
<td>0.7 (0.59–0.84)</td>
<td>56±0.1</td>
<td></td>
</tr>
<tr>
<td>Chest Pain</td>
<td>0.46 (0.38–0.56)</td>
<td>35.42±0.13</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>0.69 (0.53–0.91)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>2.33 (1.52–3.56)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Short of Breath</td>
<td>0.62 (0.5–0.76)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>General Pain</td>
<td>NS</td>
<td>32.49±0.17</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>NS</td>
<td>23.18±0.18</td>
<td></td>
</tr>
<tr>
<td>Back Symptoms</td>
<td>2.12 (1.48–3.04)</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>
64 Evaluation of Denver Health’s New Brief Screen Tool for Detection of Risky Substance Use
Kerry B Broderick1 and Melissa Richmond2
1Denver Health Medical Center, Denver, CO; 2OMNI Institute, Denver, CO

Background: Screening brief intervention and referral to treatment (SBIRT) is a public health approach to preventing risky substance use behavior in order to prevent widespread acceptance of health providers universally screening patients for risky substance use behavior. There is a need for a brief single-item screening tool with acceptable sensitivity and specificity. We developed a four-item brief substance screen (FIBSS) tool.

Objectives: The goal of the current study was to provide pilot data assessing the degree to which the FIBSS detected risky substance use compared to a validated screening tool.

Methods: Design: prospective observational cohort. Setting and Population: adult patients seen at an emergency department and an adult urgent care clinic in a large community urban safety net medical center. Data collection: at intake, nurses administered the four brief screen questions to patients. Health educators then approached patients blinded to the results of the intake brief screen and administered the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) tool. Outcomes: to assess sensitivity and specificity (and their 95% confidence intervals) of the FIBSS for detection of risky substance use, using the ASSIST scores as the reference standard for risky use.

Results: Between August 25th, 2010 and October 31st, 2010, health educators approached 2,529 patients. The final sample size for analysis was 1,692 (67% of those approached by health educators). Among these patients, 14% were engaging in risky tobacco use, 14% were engaging in risky alcohol use, 14% were engaging in risky marijuana use, and 76% were engaging in risky illicit non-marijuana drug use. Sensitivity values for the tobacco, alcohol, marijuana, and street drug questions were 88% (95% confidence interval [CI] 85.9–90.1), 76% (95% CI 71.8–81.1), 72% (95% CI 67.5–77.8), and 40% (95% CI 32.7–48.4), respectively. Specificity values for the tobacco, alcohol, marijuana, and street drug questions were 96% (95% CI 94.7–97.9), 87% (95% CI 85.3–89.0), 96% (95% CI 95.1–97.9), and 99% (95% CI 98.2–99.0), respectively. Values differed minimally as a function of patient sex, ethnicity, and setting (ED, AUC).

Conclusion: Using the ASSIST as the reference standard, there was support for the use of the single item tobacco question, limited support for the alcohol and marijuana questions, and no support for the street drug question.

65 The Impact of Implementing In-room Triage to Improve Emergency Department Throughput
Nikki Vasconcellos, Eric Schenk, Uwe Stolz, Lisa Chan, and Kevin Reilly
University of Arizona, Tucson, AZ

Background: Emergency department (ED) overcrowding continues to be a national crisis and strategies for optimizing throughput are essential. In-room triage (IRT), where registration and triage occur adjacent to the waiting room prior to the patient being placed in a treatment room.

Objectives: To evaluate the efficacy of IRT on the number of patients who left prior to medical screening (LPTMS) and patient LOS. Our study hypothesis was that IRT would not decrease the proportion of patients LPTMS or patient LOS.

Methods: We conducted a retrospective study of hospital electronic data. We compared the 5 months prior to IRT implementation (period 1: 6/2009–10/2009) to the 5 month period following the start of IRT (period 2: 11/2009–3/2010), as well as the initial 5 month period in the following year (period 3: 6/2010–10/2010).

We used multiple linear regression to compare log-transformed LOS across the three time periods and examined pre-IRT secular trends. LPTMS trends for pre-IRT months were analyzed with a test for trend.

Results: There were a total of 88,024 patient visits, of which 30% occurred during period 1, 34% during period 2, and 36% during period 3. The proportion of patients LPTMS during period 1 (pre) was 10.1%, which was significantly higher than period 2 (6.0%) and period 3 (7.6%) (p < 0.001). LOS was also significantly higher (p < 0.001) for period 1 (median 321, IQR 205–503) compared to both period 2 (281, 176–443) and period 3 (306, 189–482). Linear regression (R2=0.21, p < 0.001) confirmed that LOS was significantly higher for period 1 compared to both period 2 and 3 (p < 0.001), after controlling for patient age, acuity, and other potential confounders. There was no decreasing trend for LPTMS in pre-IRT months (p = 0.23); however, LOS did appear to decrease over pre-IRT months (p < 0.001).

Conclusion: In-room triage implementation was associated with decreases in both the proportion of patients LPTMS and patient LOS in the ED. These decreases persisted up to one year after IRT implementation. Patient LOS decreased over time prior to IRT implementation, and thus, we cannot rule out that the post-IRT decrease was due to pre-existing secular trends.

66 Physician in Triage Improves Patient Throughput
Jason Imperato1, David Binder1, Darren S Morris2, Leon Sanchez2, and Gary Setnik1
1Mount Auburn Hospital, Cambridge, MA; 2Beth Israel Deaconess Medical Center, Boston, MA

Background: Using a physician in triage (PIT) has been advanced as a way to improve patient flow in busy emergency departments (EDs), but few long-term studies have been conducted to evaluate the effect on patient flow.

Objectives: To determine if a PIT improves ED patient flow in a community teaching hospital.

Methods: An interventional study comparing patient flow parameters for the 3-month period before (April 1 - June 30, 2008) and after (July 1 - September 30, 2008) implementation of a PIT model in a 23-bed ED in a community teaching hospital with an annual volume of 36,000 patients. During the interventional time period, an additional attending physician was assigned to triage from 1 PM to 9 PM daily, and a nurse and ED technician were reassigned to the triage area. This physician conducted brief histories and exams and placed initial orders for diagnostic tests and interventions. Outcome measures were mean time to first attending physician evaluation, mean length of stay (LOS), percentage of patients who left without being seen (LWBS), and total time on ambulance diversion.

Results: Outcome measures were available for 17,499 patients, of whom 8,535 were seen before the initiation of PIT and 8,964 after. The overall mean time from registration to attending physician evaluation was reduced by 38 minutes (1:54 to 1:16, p < 0.001) while the overall mean LOS for all patients was reduced by 15 minutes (4:29 to 4:14, p < 0.001) after the intervention. Both the number of days on diversion (24 days versus 9 days, p < 0.001) and total time on diversion (68.4 hours versus 26.1 hours, p < 0.001) were decreased. Finally, there was a slight reduction in the number of patients who LWBS from 1.5% to 1.3% (p < 0.001).

Conclusion: Patient flow parameters in a community teaching hospital were improved as a result of PIT implementation.

67 Systematic Review: Emergency Department Bedside Ultrasonography for Diagnosing an Abdominal Aortic Aneurysm
Elizabeth Rubano, William Caputo, Ninfa Mehta, Lorenzo Paladino, and Richard Sinert
Downstate Medical Center, Brooklyn, NY

Background: The use of ultrasound to diagnose abdominal aortic aneurysm (AAA) has been well-studied in the radiology
Operating Characteristics of ED Ultrasonography for AAA

<table>
<thead>
<tr>
<th>STUDY</th>
<th>Patients</th>
<th>AAA n (%)</th>
<th>Sensitivity % (95%CI)</th>
<th>Specificity % (95%CI)</th>
<th>PPV% (95%CI)</th>
<th>NPV% (95%CI)</th>
<th>LR+ (95%CI)</th>
<th>LR- (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuhn 2000</td>
<td>68</td>
<td>28 (41)</td>
<td>93 (75–99)</td>
<td>100 (89–100)</td>
<td>100 (84–100)</td>
<td>95 (83–99)</td>
<td>Infinity</td>
<td>0.07 (0.02–0.27)</td>
</tr>
<tr>
<td>Rowland 2001</td>
<td>33</td>
<td>12 (36)</td>
<td>100 (70–100)</td>
<td>100 (81–100)</td>
<td>100 (70–100)</td>
<td>100 (81–100)</td>
<td>Infinity</td>
<td>0 (0–0)</td>
</tr>
<tr>
<td>Jones 2003</td>
<td>58</td>
<td>61 (40)</td>
<td>98 (85–99)</td>
<td>100 (84–100)</td>
<td>100 (89–100)</td>
<td>96 (79–99)</td>
<td>Infinity</td>
<td>0.025 (0.00–0.17)</td>
</tr>
<tr>
<td>Tayal 2003</td>
<td>125</td>
<td>27 (22)</td>
<td>100 (84–100)</td>
<td>98 (92–100)</td>
<td>93 (76–99)</td>
<td>100 (95–100)</td>
<td>49 (12–193)</td>
<td>0 (0–0)</td>
</tr>
<tr>
<td>Knaut 2005</td>
<td>104</td>
<td>5 (4.9)</td>
<td>100 (46–100)</td>
<td>97 (91–99)</td>
<td>63 (26–90)</td>
<td>100 (95–100)</td>
<td>33 (11–100)</td>
<td>0 (0–0)</td>
</tr>
<tr>
<td>Constantino 2005</td>
<td>238</td>
<td>38 (15.1)</td>
<td>94 (50–99)</td>
<td>100 (99–100)</td>
<td>100 (97–100)</td>
<td>99 (96–100)</td>
<td>Infinity</td>
<td>0.08 (0.01–0.21)</td>
</tr>
</tbody>
</table>

Results: Our search strategy identified 1,195 articles; we excluded 1,153 by relevance of title or abstract, 29 for not being in the ED, four without confirmatory tests, two case series, and one retrospective study, leaving six studies with 626 patients. Operating characteristics are shown in the Table. Conclusion: We identified six high quality studies of the operating characteristics of ED bedside ultrasonography in diagnosing AAA. All six studies showed excellent operating characteristics for both diagnosing and excluding AAA in the ED.

The Impact of Radiologic Imaging on the Management of ED Patients With Acute Abdominal Pain

Esther H Chen, Brigitte M Baumann, Asako C Matsuura, Christopher Decker, Lindsey J Gласpies, Christopher Spewock, Judd E Hollander, and Angela M Mills

University of California, San Francisco, San Francisco, CA; Cooper University Hospital, Camden, NJ; University of Pennsylvania, Philadelphia, PA; Jefferson University, Philadelphia, PA

Background: Imaging overuse is of concern given patients’ increased exposure to radiation and long-term cancer risks. In select patient populations, however, imaging may be beneficial and alter patient management.

Objectives: We sought to determine the clinical value of radiologic imaging in abdominal pain patients. We hypothesized that radiologic imaging changes both the physician’s initial diagnosis and patient disposition.

Methods: Secondary analysis of a prospective cohort of acute, nontraumatic, nonpregnant abdominal pain (±72 hours) patients in two urban academic EDs. Treating physician’s initial clinical impression, pre-imaging disposition, subsequent radiologic imaging, and final diagnosis were recorded. Descriptive data are presented as means and proportions, with 95% confidence intervals (CI) using SAS. Primary outcome was the percentage of patients with a change in their pre-imaging diagnosis and disposition due to the results of an imaging study. Secondary outcome was the effect of imaging on ED length of stay (LOS).

Results: 1,532 abdominal pain patients (mean age 39±16 years, 67% female, 51% black, 29% admitted) were enrolled, and 932 (61%) subjects underwent imaging (42% CT, 13% US, 6% radiography only (CXR or KUB; no CT or US)). Imaging changed the diagnosis in 1,020 patients (57%) and disposition in 227 patients (24%) (Table 1). Overall, mean ED LOS was 5.1 ±3.1 hours, with the longest for the CT group (6.7 ±3.1 hours). Imaging (CT, US, or radiography) extended the average LOS by 2.7 hours.

Conclusion: Imaging studies changed patient disposition in more than half and disposition in one quarter of patients evaluated for abdominal pain.

The Effect of Insurance Status on Patients Admitted for Acute Diverticulitis

Angela M. Mills, Daniel N. Holena, Michael J. Kallan, Brendan G. Carr, Caroline E. Reinke, and Rachel R. Kelz

University of Pennsylvania, Philadelphia, PA

Background: Insurance status has been previously associated with disparities in medical care, but little is known about this relation in acute diverticulitis.

Objectives: To assess whether patient insurance status affects stage of presentation, surgical treatment, and mortality in a representative national sample of patients with acute diverticulitis. We hypothesized that the underinsured (self-pay and Medicaid) would have more complicated stages of presentation, be less likely to receive surgery, and have higher mortality rates.

Methods: Retrospective analysis of adults with non-elective admission for acute diverticulitis using the 2006 Nationwide Inpatient Sample (NIS). We examined the relation between insurance status and three outcomes: stage of presentation (complicated vs. uncomplicated), treatment mode (medical vs. surgical), and mortality. Adjusted multivariate analysis was performed using logistic regression. Results are expressed as odds ratios (OR) with 95% confidence intervals (CI).

Results: Complete data were obtained on 50,040 discharges, weighted to represent 245,814 total discharges with acute diverticulitis (mean age 63.6 years, 59.9% female, 10.0% underinsured). Overall, 12.5% had a complicated stage of presentation, 12.3% were treated surgically, and 1.6% died. Underinsured patients were younger (48.0 vs. 65.3 years, p<0.001), less often female (53.5% vs. 60.6%, p<0.001), had fewer comorbidities (1.59 vs. 2.02,
p<0.001), and were more often treated at teaching hospitals (43.6% vs. 37.6%, p=0.003). After adjusting for age, sex, teaching hospital status, stage of presentation, and comorbidities, the underinsured were significantly less likely to be treated surgically (OR=0.72, 95% CI 0.64–0.82). There was no significant difference between insured groups for stage of presentation or mortality.

**Conclusion:** Underinsured status is associated with a reduced likelihood of acute surgical intervention in a representative national sample of patients with acute diverticulitis, but not with stage of presentation or mortality.

70 **Comparison of Serum Creatinine Versus Estimated Glomerular Filtration Rates for Determining Renal Dysfunction Prevalence in a Chest Pain Observation Unit**

Joseph B Borawski, Abhinav Chandra, Joshua Broder, Giselle Mani, Weijing Drake, Deborah Freeman, and Alexander Linkaiking

*Duke University Medical Center, Durham, NC*

**Background:** Computed tomography coronary angiography is currently used to evaluate patients in some chest pain observation units but is contraindicated in patients with renal dysfunction. Estimated glomerular filtration rate (GFR) can be calculated from readily available data and has been proposed as a more accurate assessment of renal function than serum creatinine level.

**Objectives:** We sought to determine the rate of agreement between GFR and serum creatinine and whether use of GFR would identify significantly more patients with renal dysfunction than serum creatinine in an observation unit population.

**Methods:** Retrospective cohort study of consecutive adult patients placed in an urban academic emergency department observation unit between 2004 and 2007. Trained abstractors collected data from electronic records including demographics and laboratory data using a standardized report form. A composite of adverse cardiac events including diagnosis of myocardial infarction, percutaneous coronary intervention, coronary artery bypass surgery, or death within 30 days and 1 year were abstracted via chart review and financial record query. GFR was estimated using the Modified Diet in Renal Disease (MDRD) formula, which accounts for patient age, sex, race, and serum creatinine. Abnormal creatinine and GFR were defined as >1.6 mg/dL and <60 ml/min/1.73m², respectively. Kappa score for the two methods and proportions of patients with renal dysfunction with 95% CI were calculated using SAS Enterprise Guide 4.2 (Cary, NC).

**Results:** A total of 2,231 patients were analyzed. Patients were 42% male, with a median TIMI risk score of 1. One hundred thirty nine patients (6.3%, 95% CI 5.3–7.3%) had a serum creatinine >1.6 mg/dL and 390 (17.5%, 95% CI 15.9–22.1%) had a GFR <60 ml/min/1.73m². Kappa for the two estimates was 0.49, suggesting moderate agreement.

**Conclusion:** Using GFR, significantly more patients with renal dysfunction were identified, suggesting renal dysfunction is widely underappreciated in clinical practice. Future work should determine if low estimated GFR predicts those at risk for contrast nephropathy from computed tomography coronary angiography.

71 **Is Pain Severity Associated With Resource Utilization In Emergency Department Patients With Abdominal Pain?**

Adam J Singer, Breena R Taira, Gregory Garra, and Henry C Thode Jr

*Stony Brook University, Stony Brook, NY*

**Background:** Several triage systems include pain severity in predicting resource utilization in the emergency department (ED). However, the association between pain severity and resource utilization in the ED is unclear.

**Objectives:** To determine the association between pain severity at triage and resource utilization in the ED. We hypothesized that pain severity would be associated with ED length of stay (LOS), hospital LOS, admission rate, and use of lab testing and imaging.

**Methods:** Study Design: retrospective chart review. Source of Data: 2008 National Hospital Ambulatory Medical Care Survey. Subjects: ED patients with abdominal pain. Measures and Outcomes: demographic and clinical information abstracted. The main outcomes were ED and hospital LOS, admission rate, and use of lab testing and imaging. Data Analysis: univariate and multivariate analysis used to determine the association between pain severity (mild, moderate, severe) and outcomes using chi-square and logistic regression.

**Results:** In 2008 there were 10.6 million ED visits by patients with abdominal pain. The mean age was 38+/−20, 66% were female, 61% were white, and 86% were adults. The distribution of pain severity was mild 13%, moderate 36%, and severe 51%. There was an association between pain severity (mild/moderate/severe) and lab testing (88%/91%/95%, respectively, P = 0.001), imaging (52%/59%/66%, P=0.002), ED procedures (49%/57%/68%, P<0.001), medication administration or prescription (78%/85%/93%, P<0.001), and hospital admission (12%/15%/18%, P = 0.02). Pain severity was not associated with ED or hospital LOS.

**Conclusion:** Increasing pain severity is associated with increased resource utilization including lab testing, imaging, procedures, medications, and hospital admissions.

72 **Radiological Imaging of Patients With Suspected Urinary Tract Stones: National Trends, Diagnoses, and Predictors**

Antonio C Westphalen, Renee Y Hsia, Judith H Maselli, Ralph Wang, and Ralph Gonzales

*University of California, San Francisco, San Francisco, CA*

**Background:** Due to its carcinogenic effect, increased exposure to medical radiation is a growing public health concern, in particular for the relatively young population affected by urinary tract stones. Increased imaging utilization also leads to increased costs to health care systems.

**Objectives:** To determine the national trends of CT and ultrasound utilization for assessment of suspected urinary tract stones in emergency departments, and if trends in imaging utilization have resulted in changes in the rates of hospital admission and diagnosis of urinary tract stones and other significant disorders.

**Methods:** Retrospective cross-sectional analysis of emergency department visits using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) between 1996 and 2007. NHAMCS data are collected in non-institutional general and short-stay hospitals throughout the United States. Sampled visits were weighted to produce national estimates. The main outcome measures were proportion of visits for flank or kidney pain receiving CT or ultrasound testing and rates of hospital admission and diagnosis of urinary tract stones and other significant disorders.

**Results:** Utilization of CT to assess patients with suspected urolithiasis increased from 4.0% to 42.5% over the study period (p-value 0.05); admission to the hospital (approximately 11%, p-value = 0.49) has not changed significantly.

**Conclusion:** From 1996 to 2007, there was a 10-fold increase in the utilization of CT scan for patients with suspected kidney stone without an associated change in the proportion of diagnosis of kidney stone, diagnosis of significant alternate diagnoses, or admission to the hospital.

73 **Differences in Outcome for Adult Patients Presenting With Hypoglycemia: A Canadian Multicenter Study**

Brian Rowe¹, Mira Singh MSc¹, Cristina Villa-Roel², Marcia Edmonds², Eddy Lang³, Marco Sivilotti⁴, Frank Scheuermeyer⁵, Andrew Worster⁶, Jennifer Riley⁷, Marc Afilalo⁸

**Background:** From May 2011, Vol. 18, No. 5, Suppl. 1 • www.aemj.org

**Objective:** To determine the association between pain severity (mild, moderate, severe) and outcomes using chi-square and logistic regression.
Background: Adverse events from hypoglycemia result in presentations to the emergency department (ED) which can be complex and difficult to treat.

Objectives: This study was designed to examine the outcome differences for patients with type I and type II diabetes mellitus (DM) presenting to the ED with hypoglycemia.

Methods: A retrospective chart review was conducted at 10 adult EDs across Canada. ICD-10 codes were used to identify applicable cases at all sites and randomized samples were obtained. A chart review was completed on patients with documented hypoglycemia (blood sugar of <3.9) and DM by trained research nurses using standard chart review methodology. Results are presented as proportions and medians with interquartile range (IQR). The main outcome of interest was treatments in the ED and outcomes.

Results: 1025 patients over the age of 17 were included in the study; 387 (38%) were type I and 638 (62%) were designated as type II DM. In type II cases males predominated; however, type II DM were significantly older (72 v 53%; p=0.001). Most patients arrived by ambulance and triage scores revealed severe presentations in 39% of cases. There were no differences in hypoglycemic presentations associated with injuries (9.6% v 9.2%). Overall, patients with type II DM were admitted to the hospital more frequently than type I (301% v 10.3%; p = 0.012); few patients with DM left against medical advice (3.6% v 1.9%; P = 0.08). No admissions in Canadian hospitals were to the endocrinology service. Discharge instructions were documented more in type I than type II DM cases (62.5% v 50%); p < 0.001.

Conclusion: Patients presenting with hypoglycemic episodes due to type II DM are often older and require hospitalization more often. Admission to generalist physicians in Canada differs from other locales, and discharge instructions vary considerably. These issues should be considered in continuing medical education activities.

74 Predictors of Adverse Events in Patients Receiving Opioids in an Emergency Setting: A Prospective Large Observational Cohort Study
Jean-Louis Ducassé, Delphine Salvan, Vanessa Houze-Cerfon, and Vincent Bounes
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Background: The clinical response to opioids is highly variable; an appealing strategy should be to find characteristics of patients or opioids used that predict the occurrence of an adverse event (AE) and to use those factors to modify interventions for groups of patients in an emergency setting.

Objectives: The aim of the study was to analyze factors predicting AEs in patients receiving opioids for acute pain in a prehospital setting.

Methods: Prospective observational analysis in a tertiary-care teaching hospital medicalized prehospital service. Adult patients who received treatment with intravenous opioids for pain control were included. The physicians of the teams were not aware of the aim of the study, and nurses made all the assessments. An independent expert committee blinded to the type and dose of the opioid received validated each AE. The primary outcome variable was the occurrence of any AE during the first 60 minutes after any opioid injection. Univariate and multivariate analyses were performed to identify factors predictive of AE, and the sample size was calculated based on the need for more than 10 outcome events per independent variable analyzed. Patient characteristics (including demographic and clinical ones), and drugs administered, including the initial and total dose of opioids, were analyzed.

Results: In total, 1010 patients, aged 45 years old (33-66), 691 (69%) of whom were male and 359 (36%) with a traumatic pain, were included. Median (interquartile range) pain scores at baseline and at arrival to the hospital were 8 of 10 (7-10) and 3 of 10 (2-5), respectively. The opioids administered were morphine for 542 patients (54%), sufentanil for 428 patients (42%), and both drugs for 40 patients (4%). Ninety-six patients (9.5%) presented an AE, all mild to moderate in severity, mainly nausea/vomiting, n = 45 (47% of all the AEs). The final model had only one independent predictor of occurrence of any AE. There is a trend in favor of males for being protected (OR 0.63; CI 0.37-1.08). Initial and total doses were not associated with an increase of the AE.

Conclusion: Morphine is a safe opioid and remains the gold standard in an emergency setting. Further studies are necessary for assessing the safety of other opioids, particularly for female patients.

75 The Association of Pain With Vital Signs
James Miner, Rebecca Nelson, Rebecca Speltz, and Johanna Moore
Hennepin County Medical Center, Minneapolis, MN

Background: It is not known the extent to which a patient’s complaint of pain is reflected in the vital signs.

Objectives: To determine if patient report of pain is associated with heart rate, respiratory rate, or systolic or diastolic blood pressure.

Methods: This was a prospective observational study at an urban, Level I trauma center with 98,000 annual visits conducted between June 1 and November 1 of 2010. Patients reporting pain ≥3/10 were eligible. Exclusion criteria included age <18, a decreased level of consciousness, or the inability to answer questions. Con- senting patients completed 100 mm visual analog scales (VAS) describing their perceived pain, after enrollment, every 30 minutes thereafter, and immediately before discharge. The patient’s heart rate, respiratory rate, and blood pressure were measured at the same time as the VAS. The association of the heart rate, respiratory rate, systolic blood pressure, and diastolic blood pressure to the pain VAS was determined using multiple regression.

Results: 2,780 patients were screened, 2171 were eligible, 551 patients refused to participate, and 1620 were enrolled (median age 38, range 18 to 101, 51.4% male, median time in study 60 minutes, range 15 to 240). 5217 VAS measurements were made over all time points, 4208 (80.7%) had vital signs included. The median VAS for pain was 76 mm (range 22 to 100, n=1620). The median HR was 78 (range 50 to 162), median respiratory rate was 16 (range 10 to 37), median systolic blood pressure was 126 mmHg (range 91 to 233), and median diastolic blood pressure was 79 mmHg (range 49 to 136). Multiple regression of the pain VAS demonstrated no correlation between the vital signs and the pain VAS (heart rate coef. 0.01, 95% CI –0.04 to 0.01; respiratory rate coef. 0.01, 95% CI –0.01 to 0.02; systolic blood pressure coef. 0.00, 95% CI –0.01 to 0.01; and diastolic blood pressure coef. 0.00, 95% CI –0.01 to 0.01).

Conclusion: Vital signs are not associated with a patient’s report of pain by VAS. Vital signs should not be used as a marker for pain.
A Pain in the Neck? Which Regions of Body Pain Are Most Associated With Pain Interference and Other Health Outcomes 6 Weeks After Motor Vehicle Collision

Kathryn Whittington, Andrey Bortsov, April Soward, Jeff Jones, David Peak, Robert Swor, David Lee, Niels Rathslev, Robert Domeier, Phyllis Hendry, William Maixner, Gary Slade, and Samuel McLean

Background: Traditionally, studies examining persistent post-motor vehicle collision (MVC) pain have focused on the neck region (whiplash-associated disorders); however, several recent studies have demonstrated that persistent post-MVC pain is not limited to the neck region.

Objectives: To assess which regions of body pain are most associated with pain interference and other health outcomes 6 weeks after MVC.

Methods: Data were from a prospective, multisite, longitudinal study of patients enrolled in the emergency department after minor MVC who were discharged to home after evaluation. Among patients reporting persistent post-MVC pain in one or more body regions 6 weeks after MVC, we examined associations between pain severity (0-10 numeric rating scale) in each body region (Regional Pain Scale) and the following 6 week health outcomes: MVC-related pain interference (Brief Pain Inventory sub-scales), post-traumatic stress disorder (PTSD) symptoms (Impact of Events Scale-Revised), depressive symptoms (Center for Epidemiological Studies Depression Scale), and mental and physical health (Short Form 12 Health Survey MCS, PCS). For each outcome, pain regions were then ranked according to strength of association (assessed via unstandardized beta regression coefficient), and mean rankings across pain interference subscales were calculated.

Results: Seventy five percent (321/427) of study participants reported persistent pain in one or more body regions 6 weeks after MVC. Among these patients, pain in the neck region had the highest mean ranking (1.4) across pain interference subscales. 6 weeks after MVC, followed by pain in the abdomen (2.4), upper back (3.6), head (3.6), and lower back (4.9) regions. Pain in the neck region was also most strongly associated with depressive symptoms, physical health, and mental health. Pain in the abdominal region was the next most strongly associated with these three outcomes, and was the pain region most strongly associated with comorbid PTSD symptoms.

Conclusion: These findings broadly support an emphasis on the neck region when examining post-MVC pain outcomes, while highlighting the important influence of pain in a number of body regions on pain interference and emotional and physical health outcomes.

Senior Patients With Moderate to Severe Pain Wait Longer for an Analgesic Medication in the Emergency Department

Raoul Daoust, Jean-Marc Chauny, Éric Notebaert, Marcel Emond, and Gilles Lavigne

Background: There is very little literature on the effect of age on the delay to receive an analgesic medication in the emergency department (ED).

Objectives: To determine the effect of age (≥65 years) on delays to the first analgesic dose (door to medication) in ED patients with moderate to severe pain.

Methods: A retrospective cohort study was performed in an urban teaching hospital with a computerized medical prescription system and nursing records (prescriptions and nurses’ notes are recorded during the patient visit). We included all consecutive ED adult patients (≥16 years) triaged to an ED bed who had a pain intensity of 6 or more out of 10 (verbal numerical scale) at triage, from March 2008 to November 2010. The primary outcome was the delay from beginning of triage to receiving an analgesic in seniors (≥65 years) compared to younger patients. Our secondary outcomes were the same delay but limited to patients with 10/10 pain intensity, mean pain intensity, and odds of receiving an opiate in each age group. We performed a log-rank test and a Cox proportional-hazard model adjusted to the level of pain.

Results: During our study period, a total of 12,110 patients 16 and older where triaged to an ED bed with a pain intensity of at least 6/10, and 7890 (65.2%) received an analgesic before discharge. 57.1% of patients were female; 70.3% were <65 years with a mean age of 41.9 years (SD ± 13.0) with a mean pain intensity of 8.4/10; and 29.7% were ≥65 years with a mean age of 76.7 years (SD ± 7.3) and a mean pain intensity of 8.0/10. There was no significant difference in mean pain intensity between the groups. The median delay to receive an analgesic for younger patients was 2.1 hours (IQR= 2.57), vs 3.1 hours (IQR 3.99) for seniors with a hazard ratio (for age) of having a longer delay to receive an analgesic of 1.53 (CI 95% 1.45–1.61). Seniors received less opiates (OR 0.86, CI 95% 0.79–0.92). For the 2818 patients reporting pain at 10/10, 79% were <65 years of age and 78.7% received an analgesic before leaving ED. The median delay to receive analgesia for younger patients was 1.6 hours (IQR 1.87) and 2.4 hours (IQR 3.98) for seniors, with a hazard ratio of 1.5 (CI 95% 1.3–1.7).

Conclusion: Patients ≥65 years and older with moderate and severe pain have a significant increase (>1 hour) in global delay before they received an analgesic medication and obtain less opiates. This does not appear to be related to pain intensity. Factors that explain this delay need to be identified.
60 minutes, range 15 to 240). 5217 VAS measurements were made over all time points. The median VAS for pain was 76 mm (range 22 to 100, n=1620), for stress was 62 mm (range 0 to 100), for anxiety was 53 mm (range 0 to 100), and for satisfaction was 35 mm (range 0 to 100). Multiple regression of the pain VAS demonstrated a correlation between the stress VAS (coef. 0.22, 95% CI 0.07 to 0.37) and the satisfaction VAS (coef. 0.12, 95% CI 0.01 to 0.25), but not the anxiety VAS (coef. 0.05, 95% CI –0.08 to 0.20).

**Conclusion:** Patients’ report of pain by VAS scale was associated with the report of perceived stress and satisfaction with treatment, but was not associated with a patient’s perceived anxiety.

## 79 Nitrous Oxide for Prehospital Analgesia: A Prospective Double-blind Randomized Multicenter Study


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**Background:** Premixed nitrous oxide and oxygen is often used in emergency medicine for pain control, but no scientific studies have demonstrated its efficacy in a prehospital setting.

**Objectives:** The aim of the study is to demonstrate the efficacy of premixed nitrous oxide and oxygen in patients with out-of-hospital moderate traumatic acute pain.

**Methods:** In this double-blind randomized clinical trial, patients were eligible for inclusion if aged 18 years or older, with acute moderate pain (defined as a numeric rating scale score between 4 and 6/10) caused by trauma. They were assigned to receive either MEOPA 6L/min, or medical air 6L/min in two paramedic-staffed ambulance centers. After the first 15 minutes, every patient receives nitrous oxide and oxygen. The primary endpoint of the study is pain relief at 15 minutes, defined as a numeric rating scale score less than or equal to 3 of 10. Secondary endpoints are treatment safety and adverse events, and time to analgesia. Pain scores were measured at baseline and every 3 minutes during the first 60 minutes. The safety evaluation included non-invasive monitoring of blood pressure, heart rate, oxygen saturation by pulse oximetry, and adverse events collection. Descriptive statistics are reported as medians with interquartile ranges. Proportions are compared by chi-square tests or Fisher’s exact test when appropriate. Differences were considered significant if the P value was less than 0.05. The sample size of 30 patients by group (60 total) was calculated on the basis of preliminary data obtained in our center, with a 0.05 type I error and a power of 90%.

**Results:** Thirty-five patients were included in this study (expected completion date 02/01/2011), median age 45 (30–65), of whom 19 (54%) were male. The median pain scores (all groups of patients) were 6 (5–6) initially, 2 (1–5) 15 minutes after randomization, and 1 (1–3) at 30 minutes. Three patients experienced an adverse event (nausea) during the protocol. All of the patients and paramedics were either satisfied or very satisfied concerning the results of the analgesic treatment.

**Conclusion:** This study emphasizes the role of nitrous oxide in prehospital setting, a rapid, non-invasive drug for early analgesia. As a single agent, it has impressive safety and is excellent for providing analgesia for patients with moderate pain.

(Originally Submitted as a "Late-blower")

## 80 Procedural Sedation Within the Scope of Emergency Medicine Practice? A 6-year Analysis

**Veronica Sikka**, **Harinder Dhindsa**, **Renee Reid**, **Cathi Holmes**, and **Hui-Min Hsieh**

Virginia Commonwealth University, Chester, VA

**Background:** To date, procedural sedation has fallen within the scope of practice of emergency medicine, but recent CMS guidelines have questioned this as appropriate for emergency physicians.

**Objectives:** The objective of this study was to determine if there existed a significant difference in the number of procedural sedations performed at a Level I trauma center over 6 years and their associated complications.

**Methods:** A retrospective, population-based sample of all procedural sedations (n= 1497) performed in a Level I, inner-city trauma center were included over 6 years (January 1, 2004 to December 31, 2009). Eight complication categories were included: 1) use of reversal agents (i.e., naloxone, flumazenil), 2) assisted ventilation (i.e., bagging, intubation), 3) unanticipated increase in level of care (i.e., anesthesia consultation, status change to observation or inpatient), 4) SpO2 < 90% for more than five minutes or persistent decrease in saturation of >10% of baseline, 5) hemodynamic instability (blood pressure +/- 20% of baseline, bradycardia or tachycardia), 6) failed sedation (unable to sedate and accomplish procedure), 7) aspiration of gastric contents, and 8) unanticipated recovery period over two hours. Chi-square tests and correlation matrices were used for the statistical analysis.

**Results:** Between 2004 and 2009, there was an overall significant difference in the number of procedural sedations performed (p<0.05). Specifically, there was an inter-year increase in the number of procedural sedations between 2006 and 2007. There was no significant correlation between the number of procedures among the years and complications and no significant difference in the percentage of complications over the years. There was also no significant difference between complication categories. Table 1 summarizes our findings.

**Conclusion:** Emergency medicine has consistently performed a high number of procedural sedations within their scope of practice over the years with no significant difference in complication rates. It would have been ideal to have similar data collected by anesthesiologists to compare outcomes between specialties. However, they are not required to report their procedural sedations.

<table>
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</table>

## 81 Direct Comparison of Video Laryngoscopes in Simulated Difficult Intubations

**Jessie Nelson**, **Casey Woster**, **Aaron Burnett**, **Josh Salzman**, **Sandi Wewerka**, and **Ralph J Frascone**

1 Regions Hospital, St. Paul, MN; 2 Regions Hospital EMS, Oakdale, MN

**Background:** Video laryngoscopy is a developing technology for advanced airway management. While marketed for use in hospital and prehospital settings, little is known about use of these devices in controlled environments.

**Objectives:** We compared rates of and times to successful intubation between direct laryngoscopy (DL), King LTS-D, and four video laryngoscopes (Glidescope GVL, McGrath Series 5, ProDol AirTraq, and Storz C-MAC) in a simulated difficult airway.

**Methods:** Following IRB-approval, emergency physicians, emergency medicine (EM) residents, and emergency medical services (EMS) providers were enrolled. Participants were surveyed on prior experience, trained on each airway device, and given time to practice intubations with each device. Participants were allowed...
82 Airway Management in the Emergency Department: A Comparison of CMAC Video Laryngoscopy to Direct Laryngoscopy
John C Sakles and Mari L Cosentino
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Background: For the last few decades, direct laryngoscopy (DL) has been the standard device for tracheal intubation in the emergency department (ED). Recently, video laryngoscopes (VLs) have been developed and incorporated into clinical practice. The advantage of a VL is that it is no longer necessary to achieve a direct line of sight to the airway as the micro video camera on the VL brings a view of the airway outside the patient’s body and onto a flat screen monitor.

Objectives: To determine the success rate of tracheal intubation using a CMAC VL versus a direct laryngoscope in ED patients.

Methods: Over a three year period in our ED, physicians performing intubation entered data regarding the intubation into a CQI database. We analyzed this prospectively collected data to determine the success rates of CMAC video laryngoscopy and DL. The data form included patient age, sex, indication for intubation, technique of airway management, medications used for intubation, and cervical immobilization in which simulated emesis is produced via concealed tubing. Providers had suction, an endotracheal tube introducer, and an airway assistant available. The data were analyzed with repeated measures ANOVA.

Results: To date, 58 EMS providers have participated. Success rates: DL = 94.8%; King = 93.1%; C-MAC = 89.7%; Glidescope = 89.7%, McGrath = 58.1%, and AirTraq = 44.8%. The AirTraq and McGrath success rates were significantly lower than the others (p<0.05 for each device comparison). Average time to insertion (seconds) were: King = 27.21±19.46, DL = 38.47±20.51; C-MAC = 41.96±17.66; Glidescope = 54.7±24.32; AirTraq = 55.8±21.63; McGrath = 67.71±27.97. King LTS-D placement was significantly faster than all others (p<0.05 for all comparisons). DL placement time was significantly faster than the Glidescope, AirTraq, and McGrath (p<0.05 for all comparisons). A second phase of this study, with emergency physicians and residents, is currently underway. Data will be analyzed separately from EMS providers.

Conclusion: Interim analysis shows rates of successful placement of the ProDol AirTraq and McGrath Series were significantly lower compared to the other devices among EMS providers. In addition, the King LTS-D was the most rapidly-placed device. (Originally Submitted as a “Late-breaker”)

83 Non-invasive Estimation of Maximum Change in Pressure Over Time (max dP/dt) by Bedside Ultrasound Measures of Peak Aortic Velocity: Assessing Pathophysiologic Changes at the Bedside
Andrew D Goldberg1, Christian McClung1, M. Arslan Hanif2, Scott T Younquist3, Atman P Shah4, John P Rosborough4 and James Niemann2
1Keck School of Medicine of the University of Southern California, Los Angeles, CA; 2Harbor-UCLA Medical Center, Los Angeles, CA; 3University of Utah, Salt Lake City, UT; 4University of Chicago, Chicago, IL

Background: Propagation of acute thoracic aortic dissection is directly related to elevated changes in pressure over time (dP/dt). Standard medical management is based on pharmacologic interventions targeted to decrease the dP/dt. Because an accurate assessment of these parameters requires invasive aortic manometry, the clinical feasibility of obtaining this measurement has been limited. Instead, goals of care are based on peripheral sphygmonometric readings that do not accurately reflect central aortic pressure or underlying pathophysiology.

Objectives: To examine whether dP/dt can be estimated using non-invasive ultrasonographic measurements of aortic flow in a dynamic model of cardiac ischemia.

Methods: Juvenile swine between 35 - 42 kg were instrumented with aortic pressure manometers during a study of ischemia-induced ventricular fibrillation. Continuous pressure tracings were recorded from baseline through cardiac arrest and resuscitation.
Intermittent measures of aortic flow velocity were obtained using a bedside ultrasound to measure the velocity time integral from a suprasternal position providing estimates of cardiac output and stroke volume. The peak velocity (v(pk)) was compared to the maximum dP/dt by linear regression.

**Results:** A total of 73 measurements were made on 22 anesthetized pigs. The mean peak velocity was 0.77 m/s (range 0.49 - 1.37 m/s). The mean dP/dt was 929 mmHg/s (range 305 - 1567 mmHg/s). The linear regression across all measurements demonstrated a positive correlation that was statistically significant (r = 0.36, p = 0.001). Observations that were limited to less than 30% stroke volume variability (n = 52) demonstrated significantly improved correlation (r = 0.44, p < 0.001).

**Conclusion:** Bedside ultrasound measures of peak velocity correlate with maximum dP/dt and can be used to assess these physiologic changes in a swine model. During periods of significant ectopy, noted by large variance in beat-to-beat stroke volume (i.e., > 30%), the estimates are less reliable. Peak velocity of blood flow across the aortic root is related to change in pressure over time under pulsatile conditions. Bedside ultrasound can accurately estimate these velocities. Altering therapy based on serial ultrasonographic measurements of peak velocity may help to improve the management of critically ill patients.

### 84 Skeletal Muscle Oxygen Consumption Is Reduced in Acute Limb Ischemia

**Huiyin Tu, Yulong Li, and Paul Tran**

**University of Nebraska College of Medicine, Omaha, NE**

**Background:** Acute limb ischemia caused by thromboembolism or traumatic injury is not an uncommon emergency condition in the emergency department (ED). Although reperfusion is essential for the survival of the ischemic limb, reperfusion itself can lead to reperfusion injury, a process that is affected by many poorly understood factors. In particular, it is unknown if energy production through oxidative phosphorylation in mitochondria is adequately restored during reperfusion.

**Objectives:** We wish to explore muscle bioenergetics as measured by oxygen consumption in post-reperfusion limb that was subjected to critical ischemia.

**Methods:** Male C57/BL6 mice (10–12 weeks, 22–35 g) were subjected to an ischemic/reperfusion (IR) protocol of 3 hours of ischemia followed by 4 hours of reperfusion. IR was induced in unilateral limb by placement and release of a rubber tourniquet at the hip joint. Sham-operated animals were subjected to the same procedure except for the application of the tourniquet. Ischemia was verified by measuring skeletal muscle blood flow (MBF) with a Transonic flow probe. Muscle necrosis was measured using triphenyl tetrazolium chloride (TTC). Superoxide anion production was measured using the lucigenin chemiluminescence method. Oxygen consumption in gastrocnemius muscle was measured using polarography.

**Results:** (Means [95% CI]): MBF was significantly reduced to about 35% of baseline during reperfusion. Superoxide production was increased in the IR group compared to shams (0.14 [0.13–0.14] vs. 0.05 [0.04–0.06] MLU/min/mg protein). Necrosis of the gastrocnemius muscle was 40.0% (33.1–46.9%). Oxygen consumption was significantly reduced in the IR group (see the Figure).

**Conclusion:** Skeletal muscle bioenergetics, as measured by oxygen consumption, is significantly reduced in reperfusion injury. This persistent impaired bioenergetics may be caused by the increased oxidative stress and serve as an important factor in the pathogenesis of morbidity and mortality in ALI.

### 85 Can the HEART Score Be Used to Further Risk Stratify Patients With Low TIMI Scores?

**Shannon Marcoon1, Anna Marie Chang1, Betsy Lee2, Asako C Matsuura3, Jeffrey Le2, Kristy M Walsh1, Jennifer Robey3, and Judd E Hollander1**

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**Background:** The ability to risk stratify patients presenting to the emergency department (ED) with potential acute coronary syndrome (ACS) is critical. The Thrombolysis in Myocardial Infarction (TIMI) risk score can risk stratify ED pts with potential ACS but cannot identify patients safe for ED discharge. The HEART score, which is more symptom-based, identifies very low-risk patients.

**Objectives:** Our hypothesis was that patients with a TIMI score of 0 or 1 may be able to be stratified further with the HEART score to identify a group of patients at less than 1% risk of 30 day adverse CV events.

**Methods:** Study Design: secondary analysis of a prospective cohort study. Setting: university hospital ED. Patients: ED pts with potential ACS > age 30. Data: demographics, history, ECG, labs, and components of the TIMI and HEART scores. Follow-up was
conducted by structured record review and phone. Main outcome: 30 day death, nonfatal MI, or revascularization. Thirty day CV event rates stratified by TIMI score and HEART score using 95% confidence intervals.

**Results:** There were 4951 patients enrolled (mean age 52.0 +/- 13.6, 55.6% female, 66.0% black). By 30 days, there were 60 deaths, 172 nonfatal AMI, and 175 revascularizations. Composite event rates with 95% CI per strata for each score at the low risk end of the spectrum are shown below.

**Conclusion:** A HEART score of 0 in a patient with a TIMI score of 0 may be able to be discharged home without further testing due to a low rate of adverse cardiac events at 30 days. At all levels of TIMI score, the HEART score was able to stratify patients with respect to 30 day risk.

### 87 Important Electrocardiographic Findings in Patients With Syncope

James Quinn¹ and Daniel McDermott²

¹Stanford University, Stanford, CA; ²California Pacific Medical Center, San Francisco, CA

**Background:** An abnormal electrocardiogram (ECG) is an important predictor for adverse outcomes in patients with syncope, but it is unclear what specific ECG findings are the most important.

**Objectives:** To determine the most important ECG findings for determining cardiac outcomes in emergency department (ED) patients with syncope.

**Methods:** A prospective consecutive cohort of ED patients with syncope or near syncope was considered. Physicians were asked to categorize the ECG as normal or abnormal based on any changes that were old or new. They also did a separate rhythm assessment and could use any of the available ECGs or monitoring strips, including prehospital strips, when making this assessment. All patients were followed up to determine a broad composite short-term outcome. Rule positive ECG criteria for the San Francisco Syncope Rule (SFSR) were any non-sinus rhythms (from any source) or new ECG changes. In this analysis the sensitivity and specificity of the ECG criteria for pre-defined cardiac outcomes (arrhythmic, ischemic, and structural) were determined. All ECGs classified as “abnormal” by the study criteria had specific ECG findings further delineated and classified based on the official cardiology reading. Ten specific ECG (isolated complete LBBB, any left bundle conduction problem, RBBB, ST segment changes, Q-waves) and rhythm (SVT, brady-arrhythmias, PVC, other ventricular, any non-sinus) findings were considered. Univariate analysis (using parametric and non-parametric tests as appropriate) and multivariate logistic regression analysis were used to determine the most important predictors for cardiac outcomes.

**Results:** 684 consecutive patients were considered, with 218 having positive ECG criteria and 42 (6%) having cardiac outcomes. ECG criteria predicted 36 of 42 patients with cardiac outcomes; sensitivity 86% (95% CI 73–93), specificity 70% (95% CI 69–70), and negative predictive value 99% (95% CI 97–99). Non-sinus rhythms from any sources (OR 2.8, 95% CI 1.1–6.8) and any left bundle conduction problem (OR 3.2, 95% CI 1.4–6.9) were most likely to be associated with cardiac outcomes.

**Conclusion:** The ECG criteria from the SFSR can help determine patients at risk of cardiac outcomes. Furthermore, any LBBB conduction problems or any non-sinus rhythms found during the ED stay should be particularly worrisome in patients with syncope.

### 88 The Lack of Gender Difference in Stress Test Utilization Among Chest Pain Unit Observation Patients

Anthony M. Napoli and Esther K. Choo

Brown University School of Medicine, Providence, RI

**Background:** Two large studies recently related that the combination of copeptin and troponin had a remarkable negative predictive value to rule out myocardial infarction (MI). However, ST elevation MI (STEMI) patients were included in these studies and probably increased the diagnostic performance of these biomarkers.

**Objectives:** The aim of this study was to analyze the diagnostic accuracy and the clinical usefulness of the combination of troponin and copeptin for rapid rule-out of non ST elevation myocardial infarction (NSTEMI) diagnosis in the emergency department (ED).

**Methods:** This study was an ancillary analysis of a prospective 11 month observational study. Consecutive patients admitted to a 32,000 visit university ED for chest pain within 12 hours of ED presentation were eligible. Patients with ST elevation on a 12-lead ECG were excluded. Troponin I (cTnI) concentrations were measured immediately at admission in the biochemistry laboratory. Blood samples for determination of copeptin were frozen at - 80°C until assayed in a blinded fashion. Physicians in the ED were blinded to the copeptin results. Based on hospital diagnostic test results and follow-up at one month, patients were classified by two independent physicians (kappa=0.72) as having acute coronary syndrome (ACS) and NSTEMI if cTnI was above 0.1 µg/L (coefficients of variations [CV] >20%) or if CV <10% on serial testing. Performance of the combination of cTnI and copeptin for NSTEMI diagnosis was studied and clinical utility was assessed by multivariate analysis, area under the curve (AUC) calculation for accuracy, and reporting operating characteristics with 95% confidence intervals.

**Results:** Out of the 641 eligible patients who were recruited, non ST elevation ACS was diagnosed in 190 patients (28%), including 95 NSTEMI. The functional assay sensitivity (CV20%) of copeptin was < 12 pmol/L. The negative predictive value of the combination of copeptin and troponin was 97.6% (95% CI 96.4–98.7) and the positive predictive value was 31.6% (95% CI 28–35.2). In addition to a predictive model that included the usual diagnostic tools for NSTEMI management, copeptin added significant incremental information and the AUC increased significantly (p<0.05).

**Conclusion:** The combination of copeptin and troponin allowed a rapid rule-out of NSTEMI at admission to the ED, and improved the early triage of patients with chest pain.
risk scores, and use of stress testing between sexes. Logistic regression was used to estimate odds ratios (ORs) for receiving testing based on sex, controlling for age, race, and either TIMI or D&F score.

**Results:** Eight hundred and eleven patients were enrolled (48% male, 52% female). The mean age for men was 52±12 and 54±12 for women (p<0.001). A greater proportion of men had risk factors of smoking, cocaine use, and family history of CAD. Men also had higher mean D&F score (42.0 vs. 24.4, p<0.001). Other individual risk factors and TIMI risk score (mean score 0.56 for both groups) did not differ between sexes. Women received testing more often than men (50% vs 43%, p = 0.19). In multivariate analysis, women had a higher OR for receiving stress testing (1.59, 95% 1.11–2.26 controlling for TIMI score; 1.70, 95% OR 1.13–2.56 controlling for D&F score).

**Conclusion:** In contrast to earlier research, our study found that stress test utilization among low-risk patients admitted to an ED CPU was higher in women. There is a need for further research on patient or provider specific factors that determine stress utilization and on how differences may affect short- and long-term outcomes.

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**Serial Adrenomedullin Predicts Outcomes in Dyspneic Emergency Department Patients**

**Patients**

William Peacock1, Richard Nowak2, Alan Maisel3, Christian Mueller4, Piotr Ponikowski5, Martin Mockel6, Chris Hogan7, Alan HB Wu8, Marl Richards9, Paul Clopton10, Gerasimos S Filipatos10, Salvatore Di Somma11, Inder Anani12, Leong L Ng13, Lori Daniels14, Sean Xavier-Neath14, Robert Christenson15, Mihael Potocki14, James McCord2, Oliver Hartmann16, Nils Morgenthaler16, and Stefan Anker6

1Cleveland Clinic, Cleveland, OH; 2Henry Ford Health System, Detroit, MI; 3VA San Diego Health Care System, San Diego, CA; 4University Hospital Basel, Basel, Switzerland; 5Medical University, Wroclaw, Poland; 6Charite, Campus Virchow-Klinikum, Berlin, Germany; 7Virginia Commonwealth University, Richmond, VA; 8University of California, San Francisco, CA; 9University of Otago, Christchurch, New Zealand; 10Athens University Hospital Attikon, Athens, Greece; 11Sant’Andrea Hospital, University La Sapienza, Rome, Italy; 12VA Minneapolis, Minneapolis, MN; 13University of Leicester, Leicester, United Kingdom; 14University of California, San Diego, CA; 15University of Maryland, Baltimore, MD; 16BRAHMS Aktiengesellschaft Biotechnology Centre Hennigsdorf, Berlin, Germany

**Background:** Adrenomedullin (ADM), a vasodilatory peptide with potent hypotensive effects, is expressed in many different tissues. ADM levels are proportional to levels of its pro-hormone, MR-proADM. Elevated in chronic heart failure, both are increased in proportion to disease severity.

**Objectives:** Our purpose was to determine if changes in MR-proADM are associated with clinical outcomes.

**Methods:** The Biomarkers in Acute Heart Failure (BACH) trial was a prospective, 15-center international study of emergency department (ED) patients presenting with dyspnea from March 2007 to February 2008. Blood samples, obtained at ED admission and repeated after hospitalization from 14 to 48 hours later, were collected in EDTA-containing plastic tubes and plasma was stored at −70°C. We defined patients as having high or low MR-proADM by using a cutpoint of 2.0 nmol/L and evaluated cohorts relative to early changes occurring during hospitalization, thus providing four groups (high-high, high-low, low-low, and low-high, at admit vs. discharge, respectively).

**Results:** Of 1641 patients enrolled, the final adjudicated diagnosis was acute heart failure (AHF) in 568 (34.6%), COPD 201 (12.2%), asthma 130 (7.0%), pneumonia 112 (6.8%), chest pain of unknown origin 106 (6.5%), bronchitis 61 (3.7%), arrhythmia 55 (3.4%), ACS 39 (2.4%), pulmonary embolism 38 (2.3%), influenza 27 (1.6%), and “other” in 304 (18.5%). Overall, 130 suffered a 90 day mortality, of whom 65 had AHF, and 65 were non-AHF. The median time to discharge was 7 days (IQR 3–12) and initial MR-proADM levels ranged from 0.03 to 12.6 nmol/l (median 0.88 nmol/l; IQR 0.57, 1.44 nmol/l). Overall, 532 (32.4%) were discharged on the day of admission. Of the remaining 1109, there were 981 with at least one additional blood draw. At admission, 191 (19.5%) had elevated MR-proADM, suggesting increased mortality. Of these, 70 (36.6%) had MR-proADM levels that declined with therapy. Patients with declining MR-proADM had a survival rate almost equal to that of patients who were never at risk (see the Figure) based on their initial MR-proADM. Including serial measurements into a time-dependent Cox model gave added value vs prediction with just an admission MR-proADM (p=0.0005).

**Conclusion:** A declining MR-proADM identifies a cohort at low risk of 90 day mortality.

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**90 Barriers to Self-efficacy Amongst Racially Similar but Ethnically Divergent Emergency Department Patients With Hypertension**

John D Purakal1, Jean Williams-Johnson2, Eric Williams2, Ibittsam Ammary3, Senga Pembra4, Joseph Kambona4, Robert Welch1, John Flack1, and Phillip D Levy1

1Wayne State University School of Medicine, Detroit, MI; 2University Hospital of the West Indies, Kingston, Jamaica; 3University of Michigan School of Public Health, Ann Arbor, MI; 4Tanzanian Training Center for International Health, Ifakara, Tanzania

**Background:** Among those with chronic hypertension (cHTN), blood pressure (BP) control is far worse when perceived self-efficacy for disease management is low. Emergency department (ED) patients with cHTN are at risk for poor BP control but little is known about self-efficacy in this group.

**Objectives:** 1) To evaluate perceived self-efficacy for medication adherence in ED patients with cHTN; and 2) to compare identifiable barriers among racially similar but ethnically divergent subgroups.
Methods: A validated, 25-item medication adherence self-efficacy scale (MASES) was administered to ED patients of African origin with cHTN at three locations: Detroit Receiving Hospital (DRH - Detroit, MI), the Tanzanian Training Center for Interna- tional Health (TTCIH - Ifakara, TZ), and University Hospital of the West Indies (UHWI - Kingston, JA). Responses to the scale along with demographic and basic clinical data were collected and multi- level comparisons were performed using Kruskal-Wallis or ANOVA tests, where appropriate.

Results: One hundred and ninety-seven patients were enrolled (97 at DRH, 50 at TTCIH, and 50 at UHWI). As shown in the Table, patient demographics (other than age and sex) and basic clinical data differed greatly by site. Responses to the MASES question- naire showed poor self-efficacy in the overall cohort with 33.7% (n = 67) expressing uncertainty or doubt that they could adhere to an antihypertensive medication regimen for the rest of their lives. Strong barriers to compliance included cost (only 45.2% [n = 88] were certain they could take their BP medications if they were expensive) and concern for adverse consequences (only 51.2% [n = 101] were certain about medication adherence in the face of side effects). The effect of cost on self-efficacy was especially pro- minent at DRH (29.9% certainty of compliance when medications cost alot vs. 52% at TTCIH, and 68% at UHWI, p<0.001) while fear of a negative effect on sexual performance was important among Jamaican respondents (only 38% certain they could take their medications when this side effect may occur vs. 63% at DRH and 62% at TTCIH; p = 0.03).

Conclusion: In this racially similar but ethnically divergent cohort of hypertensive ED patients, cost and concern over side effects were important barriers to medication self-efficacy, particu- larly in those recruited at DRH and UHWI.

92 Time to ED Presentation With Potential ACS Symptoms as Determined by Race and Gender in an Urban Population

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1Hospital of the University of Pennsylvania, Philadelphia, PA; 2Albert Einstein College of Medicine, New York, NY

Background: The longer a patient’s delay from onset of symp- toms of potential acute coronary syndrome (ACS) to emergency department (ED) presentation, the greater his or her risk of morbidity and mortality.

Objectives: To evaluate the relationship between patient, race, and sex to the delay of patient presentation to the ED after the onset of symptoms consistent with potential ACS among an urban population.

Methods: Study Design: secondary analysis of cohort study. Setting: university hospital. Patients: ED patients with potential ACS. Data: demographics, history of chest pain, ECG findings. Main Outcome: time to presentation of chest pain as a continuous

Demographic and Basic Clinical Data

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>DRH</th>
<th>TTCIH</th>
<th>UHWI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years</td>
<td>50.8 (11.5)</td>
<td>50.5 (13.1)</td>
<td>51.6 (9.1)</td>
<td>50.8 (10.4)</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>90 (45.7)</td>
<td>48 (49.5)</td>
<td>22 (44)</td>
<td>20 (40)</td>
</tr>
<tr>
<td>Mean BMI in kg/m²</td>
<td>29.7 (6.5)</td>
<td>30.9 (6.7)</td>
<td>26.3 (4.7)</td>
<td>31.3 (6.6)</td>
</tr>
<tr>
<td>Mean SBP in mmHg</td>
<td>158.6 (26.2)</td>
<td>166.8 (28.0)</td>
<td>153 (18.1)</td>
<td>152.7 (27.9)</td>
</tr>
<tr>
<td>Mean DBP in mmHg</td>
<td>100.2 (17.1)</td>
<td>107.4 (15.9)</td>
<td>99.8 (11.5)</td>
<td>91.4 (14.5)</td>
</tr>
<tr>
<td>Less than high school education, n(%)</td>
<td>89 (45.2)</td>
<td>23 (23.7)</td>
<td>44 (88)</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Currently employed, n (%)</td>
<td>109 (55.3)</td>
<td>50 (51.5)</td>
<td>27 (54)</td>
<td>32 (64)</td>
</tr>
<tr>
<td>Income insufficient for needs, n(%)</td>
<td>136 (69)</td>
<td>65 (67)</td>
<td>47 (94)</td>
<td>24 (48)</td>
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<tr>
<td>Smoker, n (%)</td>
<td>54 (27.4)</td>
<td>50 (51.5)</td>
<td>2 (4)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>ETOH, n (%)</td>
<td>57 (29)</td>
<td>48 (49.5)</td>
<td>4 (8)</td>
<td>5 (10)</td>
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<td>Cocaine use, n (%)</td>
<td>16 (8.1)</td>
<td>16 (16.5)</td>
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<td>0 (0)</td>
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<td>HTN duration, yrs</td>
<td>9.5 (9.6)</td>
<td>12.1 (11.0)</td>
<td>4.6 (5.8)</td>
<td>9.1 (7.6)</td>
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<tr>
<td>No medications n (%)</td>
<td>19 (9.6)</td>
<td>15 (15.5)</td>
<td>4 (8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Exercise, n (%)</td>
<td>126 (64)</td>
<td>64 (66)</td>
<td>35 (70)</td>
<td>27 (54)</td>
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<tr>
<td>Low salt diet, n (%)</td>
<td>105 (53.8)</td>
<td>34 (35)</td>
<td>44 (88)</td>
<td>27 (54)</td>
</tr>
</tbody>
</table>

Table: All n = 197, DRH n = 97, TTCIH n = 50, UHWI n = 50.
variable. Analysis. Wilcoxon test was used to handle the nonparametric data, and examined the differences between male and female, black and non-black patients on time from onset of symptoms to ED presentation. Rank transformation analysis of covariance (ANCOVA) was applied to examine the differences after adjusting for typical vs atypical symptoms, diagnosis of ACS, and presenting ECG interpreted as ischemic vs nonischemic.

Results: During the study period, there were 4863 pts enrolled (mean age, 52.4 ±13.3; 56% female; 66% black) with mean presentation time of 1518 minutes (SD ±2751; IQR 75.4–1440). A Wilcoxon test indicated that men presented to the ED after a shorter length of time from onset (mean 1437 minutes SD ±2658, median 240 minutes) than women (mean 1581 minutes SD ±2785, median 300 minutes) (Z = –3.26, p = 0.001), and that non-blacks presented with shorter onset time (1519 minutes SD ±2546, median 240 minutes) than blacks (1614 minutes SD ±2807, median 300 minutes) (Z = –3.96, p = <0.0001). Adjusting for symptoms, diagnosis, and ECG presentation, men did not differ on onset duration from women (F = 0.52, p = 0.93), and non-blacks did not differ from blacks (F = 0.96, p = 0.49).

Conclusion: Blacks and females had increased time to presentation to ED with symptoms consistent with potential ACS. After adjustment for symptom presentation, ECG findings, and final diagnosis of ACS, there was no difference in time to presentation.

93 Exaggerated Microcirculatory Blood Flow Response Is Associated With Unexplained Chest Pain in Low-Moderate Risk Emergency Department Patients
Basmah Saftdar1, Gail D’Onofrio1, Asad Ali1, and Stuart D. Katz2
1Yale University, New Haven, CT; 2New York University, New York, NY

Background: Unexplained chest pain (CP) constitutes three-quarters of the 8 million annual emergency department (ED) CP visits. Coronary microvascular dysfunction may play a role in such patients, particularly in women, and has poor prognosis. Flow-mediated dilation of the brachial artery (FMD) is a validated surrogate of coronary function (a conduit artery) and its blood flow velocity ratio reflects microvascular function.

Objectives: To compare the endothelial function of the brachial artery and peripheral microcirculation in patients with acute CP with healthy controls.

Methods: Prospective observational study of low-moderate risk patients admitted with CP (less than 24 hours) to a tertiary care ED-CP Center. Patients with renal failure, systolic BP >180 or <100 mmHg, or inability to consent were excluded. Controls were healthy volunteers without CP or risk factors. Demographic and clinical data were collected in the ED; phone follow-ups (FUP) were conducted at 1 month using the Brief Pain Inventory. A trained research assistant recorded all measurements 7am–10am on intravenous anti-hypertensive therapy. (Table 1) after adjusting for typical vs atypical symptoms, diagnosis of ACS, and ECG presentation. Men did not differ on onset duration from women (F = 0.52, p = 0.93), and non-blacks did not differ from blacks (F = 0.96, p = 0.49).

Conclusion: Blacks and females had increased time to presentation to ED with symptoms consistent with potential ACS. After adjustment for symptom presentation, ECG findings, and final diagnosis of ACS, there was no difference in time to presentation.

Table 1

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Mann Whitney</th>
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<tr>
<td>FMD (%)</td>
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<tr>
<td><strong>Endothelium Dependent</strong></td>
<td></td>
</tr>
<tr>
<td>Patients</td>
<td>5.0</td>
</tr>
<tr>
<td>Controls</td>
<td>5.4</td>
</tr>
<tr>
<td>Male</td>
<td>3.2</td>
</tr>
<tr>
<td>Female</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Endothelium Independent</strong></td>
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<tr>
<td>Patients</td>
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<tr>
<td>Controls</td>
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<tr>
<td>Male</td>
<td>1.3</td>
</tr>
<tr>
<td>Female</td>
<td>1.8</td>
</tr>
</tbody>
</table>

94 Description of Patients Requiring Prolonged Intravenous Treatment for Hypertension: Observations From the Prospective, Multicenter, Randomized Clue Trial
Abhinav Chandra1, Alexander Limkakeng1, Weiying Drake1, Giselle Mani1, Deborah Freeman1, Brigitte M Baumann2, Pierre Borczuk3, Chad Cannon4, David M Cline4, Deborah Diercks5, Brian Hiestand6, Amy Hsu7, Preeti Jois-Bilowich8, Brian Kaminski9, Phil Levy10, Richard Nowak11, Jon Schrock12, Joseph Varon13, and W Frank Peacock10
1Duke University Medical Center, Durham, NC; 2Cooper University, Camden, NJ; 3Massachusetts General Hospital, Boston, MA; 4University of Kansas Hospital, Kansas City, KS; 5Wake Forest University School of Medicine, Winston Salem, NC; 6Davis Medical Center, Sacramento, CA; 7The Cleveland Clinic, Cleveland, OH; 8University of Florida College of Medicine, Gainesville, FL; 9Toledo Hospital, Toledo, OH; 10Wayne State University, Detroit, MI; 11Henry Ford Hospital, Detroit, MI; 12MetroHealth Medical Center, Cleveland, OH; 13St. Lukes Episcopal Hospital, Houston, TX

Background: Affecting nearly 500,000 patients in the US annually, and contributing to about 3% of all emergency department (ED) visits, uncontrolled hypertension can be a serious and life-threatening presentation. Currently, no patient characteristics have been reported to identify patients resistant to antihypertensive therapy in the ED.

Objectives: To compare the characteristics of patients who reached target blood pressure to those who did not after 30 minutes of intravenous anti-hypertensive therapy.

Methods: We performed an analysis of a secondary cohort from the prospective, randomized, open-label, multicenter CLUE study. Patients were eligible for enrollment if they were at least 18 years old and presented to one of 13 US EDs with consecutive systolic blood pressure (SBP) readings of > 180 mm Hg. After consent, the physician set a target BP and the patient was randomized to 30 minutes of labetalol or nicardipine infusion. Nonresponders were defined as not achieving target BP +20 mm Hg within 30
Background: Acute coronary syndrome (ACS) is a common cause of chest pain in emergency department (ED) patients. Risk stratification of ACS is dependent upon the duration of chest pain. However, the reliability of this measure has not been determined.

Objectives: To determine the inter-observer reliability of chest pain duration and presence of ACS. We hypothesized that duration of chest pain is dependent upon the duration of chest pain. In contrast, there is poor inter-observer reliability for the longest episode of chest pain. There is no association between length of chest pain and presence of ACS.

Methods: Design: prospective observational. Setting: academic, suburban ED with annual census of 90,000. Subjects: convenience sample of adult ED patients with chest pain of non-traumatic origin and determine the association between duration of chest pain and presence of ACS. We hypothesized that duration of chest pain would be reliable (r > 0.8) and that ACS would be unlikely in patients with chest pain that lasted <1 minute.

Results: Eighty-three patients were enrolled in the study: 55% were male, 92% were white, the mean age was 56±14 years, and 34% had a final diagnosis of ACS. Inter-observer agreement for number of chest pain episodes was 0.54 (95% CI 0.35-0.72). Correlation between physician assessments for duration of shortest chest pain episode was 0.93 (95% CI 0.90-0.97). Inter-observer correlation between physician assessments for duration of longest episode was 0.13. Based on the first observer, over two-thirds of the patients had chest pain episodes of 1 hour or less. There was no association between length of the shortest chest pain episode and a final diagnosis of ACS (p=0.38).

Conclusion: In ED patients with suspected ACS, inter-observer reliability for duration of chest pain is excellent with regard to the shortest duration. In contrast, there is poor inter-observer reliability for the longest episode of chest pain. There is no association between length of chest pain and presence of ACS.

95  Reliability of Chest Pain Duration and Its Association With ACS

Anna Domingo, Tara Colvin, Henry C Thode, Jr, and Adam J Singer
Stony Brook University, Stony Brook, NY

Exclusion by SCR

<table>
<thead>
<tr>
<th>ExCr</th>
<th>Age</th>
<th>Males Excluded</th>
<th>Females Excluded</th>
<th>% Males excluded</th>
<th>% Females excluded</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR≥1.3</td>
<td>325</td>
<td>163</td>
<td></td>
<td>29</td>
<td>19</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SCR≥1.5</td>
<td>198</td>
<td>98</td>
<td></td>
<td>17</td>
<td>11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>20–39</td>
<td>5</td>
<td>2</td>
<td></td>
<td>4 **</td>
<td>5 **</td>
<td>0.850</td>
</tr>
<tr>
<td>40–59</td>
<td>40</td>
<td>10</td>
<td></td>
<td>7 **</td>
<td>3 **</td>
<td>0.003</td>
</tr>
<tr>
<td>60+</td>
<td>152</td>
<td>86</td>
<td></td>
<td>32 **</td>
<td>18 **</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SCR≥1.8</td>
<td>115</td>
<td>51</td>
<td></td>
<td>10</td>
<td>6</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Exclusion by GFR

| GFR<60 | 295  | 301 |           | 26              | 34                | <0.0001 |
| GFR<65 | 20–39 | 5    | 3          | 4 **            | 8 **              | 0.640   |
| 40–59  | 63   | 49   |            | 12 **           | 13 **             | 0.590   |
| 60+    | 227  | 249  |           | 47 **           | 53 **             | 0.070   |
| GFR<65 | 148  | 168  |            | 13              | 19                | <0.0001 |
| GFR<30 | 68   | 54   |            | 6               | 6                 | 0.960   |

*P value compares percent of males versus females excluded at that cutoff
**Denominator is the number of subjects in that age and sex group

Background: Cardiac CT (CCT) is used to evaluate patients who present to the emergency department (ED) with chest pain. CCT can lead to contrast induced nephropathy (CIN). Numerous serum creatinine (Scr) and estimated glomerular filtration rate (GFR) cutoffs have been proposed as exclusion criteria (ExCr) for CCT.

Objectives: We hypothesized that the percent of ED patients meeting ExCr for CCT would vary by the type of renal function test (RFT) used and that the use of GFR would lead to a higher exclusion rate for females.

Methods: This was a descriptive secondary analysis of the prospective ROMICAT I study. All adult patients who presented to the ED with a complaint of chest pain were screened using their first ED SCR. The modification of diet in renal disease (MDRD) formula was applied to calculate estimated GFR in ml/min/1.73 mm2. We calculated the percent of patients meeting ExCr for CCT using selected published SCR and GFR cutoff values. Univariate chi-square testing was used with a two-tailed p value ≤0.05 considered statistically significant.

Results: Of 2390 patients originally screened, 376 (16%) were first excluded for the following reasons: ischemic ECG 115 (5%), abnormal troponin 105 (4%), contrast allergy 57 (2%), missing data 10 (0.4%). Among the 2014 patients remaining, the median age was 60 (range 18–101, IQR 49–73), and 1135 (56%) were male. The Table indicates the percent of the overall study...
population and subpopulations that met ExCr. Over all cutoff values of SCr, males were more likely to meet ExCr. Using GFR cutoff values of ≤ 60 and ≥ 45, females were more likely to meet ExCr.

Conclusion: In determining eligibility of ED pts for CCT, the choice of RFT is an important consideration. The choice of SCr versus GFR selectively affects exclusion rates by sex.

97 Relationship Between Pain Severity and Outcomes in Patients Presenting With Potential Acute Coronary Syndromes (ACS)
Meredith Edwards, Anna Marie Chang, Asako C Matsuura, Kristy M Walsh, Michael D Green, Jeffrey Le, Jennifer L Robey, and Judd E. Hollander
University of Pennsylvania, Philadelphia, PA

Background: Although lay people often assume that severe pain is more commonly associated with worse outcomes, the relationship between pain severity and outcome for patients presenting with a potential acute coronary syndrome (ACS) has not been well-described.

Objectives: We hypothesized that pain severity would not be associated with acute myocardial infarction (AMI) or 30-day cardiovascular (CV) complications.

Methods: We conducted a secondary analysis of a prospective cohort study of patients presenting to the emergency department (ED) with potential ACS. Trained research assistants collected data including demographics, medical history, symptoms, hospital course, and 30-day outcomes (record review and phone). Pain score on arrival (0–10) was abstracted from the electronic record. Severe pain was defined as 9 or 10. The main outcomes were risk of AMI during the index visit and the composite of death, AMI, or severe pain (aRR 1.27, 0.95–1.70), but were at increased risk of 30-day CV events (adjusted RR 1.44, 95% CI 1.07–1.93). In multivariable models adjusting for age, TIMI score, and presenting ECG, patients with an abnormal creatinine did not have an increased risk of AMI (adjusted RR 1.43, 95% CI 0.94–2.09) but were at increased risk of 30-day CV events (adjusted RR 2.67, 95% CI 1.56–4.59) and 30-day CV events (adjusted RR 2.29, 95% CI 1.56–3.36), and ECGs that were abnormal, ischemic, or suggestive of AMI also indicated increased Risk of AMI (adjusted RR 1.43, 95% CI 1.14–2.74) and 30-day CV events (adjusted RR 1.52, 95% CI 1.12–2.06).

Conclusion: In ED patients with chest pain or ischemic equivalent, renal dysfunction predicts a higher likelihood of AMI and 30-day CV events, but is not an independent predictor of AMI after controlling for age, TIMI score, and presenting ECG.

98 Relationship Between Kidney Disease and Outcomes in Emergency Department Patients Presenting With Potential Acute Coronary Syndromes
Meredith Edwards, Asako C Matsuura, Jennifer Robey, Kristy M Walsh, Emily Barrows, Jeffrey Le, and Judd E. Hollander
University of Pennsylvania, Philadelphia, PA

Background: Population-based cohort studies found renal dysfunction is associated with development of coronary disease.

Objectives: We determined whether patients with renal dysfunction who present to the emergency department (ED) with potential acute coronary syndrome (ACS) are at increased risk of acute myocardial infarction (AMI) or 30-day cardiovascular events.

Methods: We performed a secondary analysis of a prospective cohort study of patients presenting to the ED with potential ACS. All patients who had a serum creatinine ordered as part of the evaluation are included. Trained research assistants collected demographics, medical history, symptom characteristics, and disposition information. Investigators followed the hospital course and obtained 30-day follow-up information. The main outcome was in-hospital AMI and a composite of 30 day CV events (death, non-fatal AMI, revascularization). Multivariable models were pre-specified to include age, TIMI score, and presenting electrocardiogram (ECG). Data are presented as relative risk (RR) and 95% confidence intervals.

Results: 3,451 patients had creatinine values (age, 52.9 +/- 13; 55% female; 65% black). There were 120 AMI during the initial visit, and 232 patients met the 30-day composite outcome (43 deaths, 128 AMI, 120 revascularizations). Creatinine values were normal in 3,086 (89.4%), between 1.5–2.9 ng/ml in 243 (7%), and 3.0 ng/ml or greater in 122 (3.5%). AMI at presentation was more common in patients with an abnormal creatinine (RR 2.57, 95% CI 1.71–3.87) as was 30 day CV outcome (RR 2.69, 95% CI 2.03–3.56). In multivariable models adjusting for age, TIMI score, and presenting ECG, patients with an abnormal creatinine did not have an increased risk of AMI (adjusted RR 1.43, 95% CI 0.94–2.09) but were at increased risk of 30-day CV events (adjusted RR 2.67, 95% CI 1.56–4.59) and 30-day CV events (adjusted RR 2.29, 95% CI 1.56–3.36), and ECGs that were abnormal, ischemic, or suggestive of AMI also indicated increased Risk of AMI (adjusted RR 1.43, 95% CI 1.14–2.74) and 30-day CV events (adjusted RR 1.52, 95% CI 1.12–2.06).

Conclusion: In ED patients with chest pain or ischemic equivalent, renal dysfunction predicts a higher likelihood of AMI and 30-day CV events, but is not an independent predictor of AMI after controlling for age, TIMI score, and presenting ECG.
Decline in the Incidence and Severity of Acute Coronary Syndrome Among Emergency Department Patients With Potential Ischemic Chest Pain From 2000 to 2006: A Prospective Analysis

Frank Schueermeyer1, Grant Innes2, Hubert Wong1, Eugenia Yu1, Barb Boychuk1, Eric Graffstein1, and Jim Christenson1

1University of British Columbia, Vancouver, BC, Canada; 2University of Calgary, Calgary, AB, Canada

Background: Patients presenting to an emergency department (ED) with potential ischemic chest pain have a reported 12–25% acute coronary syndrome (ACS) rate. Although the population rate of ACS has decreased over the past decade, this trend has not been reported among ED patients with potential ischemic chest pain.

Objectives: We sought to compare the incidence of ST elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina in two comparable cohorts of chest pain patients in 2000 and 2006.

Methods: Cohorts of ED chest pain patients were prospectively enrolled at a university hospital in both 2000 and 2006. Patients were followed for 30 days to determine the primary outcome of ACS. Both cohorts were stratified into ACS subgroups (STEMI, NSTEMI, and unstable angina [UA]) and compared on EKG changes (proportion of patients with predefined ischemic features) and cardiac biomarkers (median initial biomarker elevation).

Results: Groups were similar in age, sex, and vital signs. ACS prevalence was 21.4% (199/931) in 2000 and 11.4% (127/1116) in 2006 (difference 10.0%, 95% CI 6.8–13.3%), with all three subtypes decreasing significantly. In the STEMI population, median biomarker elevation decreased from 4.35 μg/L to 0.05 μg/L. In the NSTEMI group, biomarkers remained constant, as did the proportion of patients with ischemic EKG features (67.7 vs. 63.3%). In UA patients, ischemic EKG changes declined from 49.1 to 25.0%. The proportion of UA patients with normal EKGs and negative biomarkers increased from 50.9 to 72.7%.

Conclusion: From 2000 to 2006, the incidence of ED patients with ACS decreased by nearly 50%. 2006 ACS patients had fewer ischemic EKG findings, lower biomarker elevations, and a higher proportion of patients with no EKG changes and negative biomarkers. This may make ED diagnosis of ACS more challenging.

Predictive Performance of the Grace Freedom From Events Score in Patients Admitted to the Hospital for Investigation of Chest Pain

Anne-Maree Kelly and Sharon Klim

Joseph Epstein Centre for Emergency Medicine Research at Western Health, St Albans, Australia

Background: The coronary care unit model of care is expensive and based on the early detection and treatment of life-threatening complications of acute coronary syndromes (ACS), especially ventricular arrhythmias. Recently, a new score derived from registry data, the GRACE Freedom from Events Score (GRACE FFES), has been developed to predict patients at low-risk of serious adverse events, raising the possibility of safe management in a less intensive and costly environment.

Objectives: The aim of this project was the external validation of the GRACE FFES in a ‘real world’ chest pain population. We hypothesized that the score would have high negative predictive value (NPV, >95%) for serious adverse events.

Methods: This was a prospective cohort study of patients admitted to the hospital via the emergency department (ED) for the investigation and management of potential ACS. Patients were identified from ED patient management databases. Patients with STEMI at ED presentation were excluded. Data collected included demographics and clinical, risk factor, EKG, biomarker, and outcome data. The outcome of interest was the predictive performance of the GRACE FFES (low-risk score ≤287) for identification of patients suffering serious adverse events defined as death, new myocardial infarction (MI) or life-threatening arrhythmia. Data analysis was by ROC curve and clinical performance analyses. Based on previous data we estimated that in order to have 95% CI for NPV < +/- 5%, a sample of approximately 400 patients was required.

Results: Three hundred and ninety-six patients were enrolled; median age 65 years [IQR 56–76], 65% male, median TIMI score 3 (IQR 2–4), 34.6% troponin >99th percentile at ED presentation, and 31.6% with final diagnosis of myocardial infarction. Median GRACE FFES was 263 [IQR 213–291], and 29.5% were classified low-risk by the score. There were no deaths, cardiac arrests, or sustained ventricular arrhythmias. There were three cases of high-degree AV block requiring treatment, and one new MI. Predictive performance was good (AUC 0.91, 95% CI 0.84–0.98). Sensitivity for serious adverse events was 100% (95% CI 40–100%), with negative predictive value of score ≤287 of 100% (95% CI 96–100%).

Conclusion: The GRACE FFES was highly predictive of adverse events, with excellent negative predictive value. It shows promise as a tool for stratification of patients to level of care based on risk. Broader, multi-centre validation studies are justified.

Elevated Blood Pressure in Emergency Department: Are We Adhering to Guidelines?

Srikar Adhikari1, Ross Mathiasen2, Ilir Frikakj3, and Lina Lander3

1University of Arizona Health Sciences Center, Tucson, AZ; 2University of Iowa, Iowa City, IA; 3University of Nebraska Medical Center, Omaha, NE

Background: The American College of Emergency Physicians (ACEP) 2006 asymptomatic hypertension clinical policy guideline recommends that emergency physicians refer emergency department (ED) patients with elevated blood pressure (BP) for follow-up of possible hypertension.

Objectives: To determine emergency physicians’ adherence to ACEP policy recommendations in the assessment of patients with asymptomatic elevated BP in the ED.

Methods: Retrospective review of a tertiary care center ED’s electronic medical records. ED records of 880 consecutively presenting patients were reviewed. Inclusion criteria: 1) age ≥ 19 years, 2) SBP ≥ 140 or DBP ≥ 90, 3) no chest pain, SOB, or neurologic symptoms, 4) not pregnant, and 5) discharged from ED. Patient demographics, history, physical examination findings, diagnostic test results, treatment, disposition plan, and documentation of BP counseling/referral were collected from the records. Descriptive statistics were used to summarize the data. Fisher’s exact test was used for all comparisons.

Results: A total of 179 patients (female 102, male 77) met eligibility criteria. The mean age of our study subjects (whites 60%, blacks 31%) was 44 years +/- 17.9 (SD). Thirty-six percent of study patients were uninsured and 23% had no primary care physician (PCP). The mean SBP and DBP at triage were 150 and 87, respectively. Twenty-four percent had severe BP elevation (SBP ≥160 or DBP ≥100) at triage. The repeat mean SBP and DBP in the ED were 149 and 83, respectively. No association was found between pain score and BP recorded in triage and ED (p=0.3). BP was not...
rechecked in the ED in 8% of patients. Fundoscopic examination was not documented in 97% of patients. End organ damage evaluation was done in 3% of patients. Only 6% were informed of elevated BP and follow-up recommendations were given. BP counseling was done in 5% of subjects. High BP was treated in the ED in 2% of patients. HTN-related diagnosis was listed in 4% of patients and antihypertensive prescriptions were given to 1% of patients. Specific BP related discharge instructions were given to only 5% of patients. Sixteen percent had severe BP elevation at the time of discharge.

Conclusion: A vast majority of the ED charts had no documentation of counseling and referral for elevated BP. Our study results demonstrate that efforts are needed to increase ED counseling, and referral of patients with elevated BP in ED.

103 Women of Childbearing Age Have a Survival Benefit After Out-of-hospital Cardiac Arrest

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1Denver Health Medical Center, Denver, CO; 2Emory University, Atlanta, GA; 3University of Colorado, Denver, CO

Background: Female sex hormones (estrogens and progesterone) have been shown to be protective in ischemic reperfusion injuries, but few studies have examined the relationship between these hormones and survival after out-of-hospital cardiac arrest (OHCA). We hypothesized that younger females (ages 12–49), who have the highest estrogen levels, would have increased survival after OHCA when compared to other combined age/sex groups.

Objectives: To estimate the association between high levels of female sex hormones and survival after OHCA.

Methods: We conducted a secondary analysis of prospectively collected data from 29 U.S. cities that participate in the Cardiac Arrest Registry to Enhance Survival (CARES) from October 1, 2005 through December 31, 2009. Patients were included if they were 12 years or older and had a documented resuscitation attempt (n=19,398). Subjects were stratified based on age and sex into four groups: 1) younger females (ages 12–49, n=1,238), 2) younger males (ages 12–49, n=2,242), 3) older females (age ≥50 years, n=6,640), and 4) older males (age ≥50 years, n=9,953). Hierarchical multivariable logistic regression analysis was used to estimate the associations between survival in the four groups while adjusting for race, bystander CPR, AED use, location of arrest, arrest in the presence of EMS, and initial rhythm.

Results: Young females had the highest survival prevalence (F12-49:11.6%; M12-49: 11.2%; F≥50: 6.9%; M≥50: 9.6%). In the fully-adjusted model, the younger female group was associated with an increased survival as compared to all other groups (OR 1.63, 95% CI 1.33-1.99). In a subgroup analysis, younger females had an increased odds of survival in both shockable and non-shockable rhythms (shockable: OR 1.66, 95% CI 1.26-2.19; non-shockable: OR 1.54, 95% CI 1.14-2.08).

Conclusion: Younger females are associated with increased survival following cardiac arrest. Further research needs to be conducted on the pathophysiologic mechanisms of female sex hormones in relation to survival from cardiac arrest.

104 The Corrected QT Interval Is “Prolonged” in the Majority of Patients With Left Bundle Branch Block

Kenneth W Dodd1, Erin Broberg1, and Stephen W. Smith2

1University of Minnesota School of Medicine, Minneapolis, MN; 2Hennepin County Medical Center, Minneapolis, MN

Background: In the presence of normal conduction, cardiac ischemia is associated with a prolonged QTc interval. Additionally, prolonged QTc is associated with ventricular tachyarrhythmias, including torsades de pointes and sudden cardiac death. In normal conduction, QTc duration > 450 ms is generally considered prolonged, and > 500 ms potentially dangerous. We are unable to find published data on either normal or prolonged QTc in left bundle branch block (LBBB).

Objectives: To measure the QTc in emergency department (ED) patients with LBBB with and without myocardial infarction.

Methods: Retrospectively, ED patients were identified with LBBB and ischemic symptoms but no evidence of myocardial infarction (no-MI), with LBBB and non-ST elevation myocardial infarction (NSTEMI), and with LBBB and angiographically-proven acute coronary occlusion (STEMI). The QTc was recorded directly from ECGs measured during the time of symptoms. If multiple ECGs were recorded during symptoms, the first such ECG was used. QTc intervals were calculated by computer-generated algorithms that used the Bazett’s formula. The QTc mean and median were calculated for both the NSTEMI and STEMI groups and compared to the no-MI group. Statistics were by two-tailed Student’s t-test and Mann-Whitney U test.

Results: The no-MI, NSTEMI, and STEMI groups consisted of 105, 24, and 33 patients, respectively. The percentage of patients with QTc > 450 ms in the no-MI, NSTEMI, and STEMI groups were 83%, 87%, and 73%, respectively. There was no significant difference between the mean or median QTc intervals of any group (see the Table).

Conclusion: The QTc is prolonged in the majority of patients with LBBB, regardless of the presence or absence of myocardial infarction. There is no difference in the QTc between patients with LBBB and NSTEMI or STEMI and those with LBBB without any myocardial infarction.

<table>
<thead>
<tr>
<th>QTc in LBBB</th>
<th>p vs. no-MI</th>
<th>p vs. NSTEMI</th>
<th>p vs. STEMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>484.0 (+/- 6.24)</td>
<td>482 (455,509)</td>
<td>486 (457,511)</td>
</tr>
<tr>
<td>no-MI</td>
<td>483.5 (+/- 7.42)</td>
<td>486 (457,511)</td>
<td>481 (456,515)</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>489.7 (+/- 14.13)</td>
<td>481 (456,515)</td>
<td>481 (456,515)</td>
</tr>
<tr>
<td>STEMI</td>
<td>481.5 (+/- 16.90)</td>
<td>481 (456,515)</td>
<td>472 (449,494)</td>
</tr>
</tbody>
</table>

105 Differences and Similarities in Explanatory Models of Hypertension in the United States, Tanzania, and Jamaica

John D Purakal1, Jean Williams-Johnson2, Eric Williams3, Ibtissam Ammary4, Senqa Pemba5, Joseph J Kambona5, Robert Welch5, John Flack5, and Phillip D Levy1

1Wayne State University School of Medicine, Detroit, MI; 2University Hospital of the West Indies, Kingston, Jamaica; 3University Hospital of the West Indies, Kingston, Jamaica; 4University of Michigan School of Public Health, Ann Arbor, MI; 5Tanzanian Training Centre for International Health, Ifakara, Tanzania

Background: Disease misperceptions may contribute to emergency department (ED) presentation with poorly-controlled chronic hypertension (cHTN).

Objectives: 1) To explore disease knowledge in ED patients with cHTN using explanatory modeling; and 2) to compare gaps in cHTN knowledge across racially similar but geographically divergent ED patients.

Methods: Emergency department patients of African origin with cHTN were recruited from three sites: Detroit Receiving Hospital (DH - Detroit, MI), the Tanzanian Training Center for International Health (TTCIH - Ifakara, TZ), and University Hospital of the West Indies (UHWI - Kingston, JA). Demographic and baseline data were collected along with open-ended responses to a series of questions related to cHTN. Qualitative responses were coded into disease-relevant, quantitative domains by two separate, blinded reviewers.

<table>
<thead>
<tr>
<th>Mean QTc (+/- CI)</th>
<th>p vs. no-MI</th>
<th>Median (IQR)</th>
<th>p vs. NSTEMI</th>
<th>p vs. STEMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>484.0 (+/- 6.24)</td>
<td>482 (455,509)</td>
<td>486 (457,511)</td>
<td>481 (456,515)</td>
</tr>
<tr>
<td>no-MI</td>
<td>483.5 (+/- 7.42)</td>
<td>486 (457,511)</td>
<td>481 (456,515)</td>
<td>472 (449,494)</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>489.7 (+/- 14.13)</td>
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<td>481 (456,515)</td>
<td>481 (456,515)</td>
</tr>
<tr>
<td>STEMI</td>
<td>481.5 (+/- 16.90)</td>
<td>481 (456,515)</td>
<td>472 (449,494)</td>
<td>472 (449,494)</td>
</tr>
</tbody>
</table>
(Cohen's kappa = 0.99), and multilevel comparisons were performed using Kruskal-Wallis or ANOVA tests, where appropriate.

**Results:** One hundred and ninety-seven patients were enrolled: 97 (49.2%) at DRH, 50 (25.4%) at TTCIH, and 50 (25.4%) at UHWI. Mean (SD) age (50.5 [13.1] yrs vs. 51.6 [9.1] yrs vs. 50.8 [10.4] yrs; p=0.86) and sex distribution (% male: 49.5 vs. 44 vs. 40; p= 0.53) were similar across sites, but patients at DRH were more hypertensive at presentation (mean systolic blood pressure [SD] in mmHg: 166.8 [28.0] vs. 153 [18.1] vs. 152.7 [27.9], p=0.003), had a longer mean (SD) duration of cHTN (12.1 [11.0] yrs vs. 4.6 [5.8] yrs vs 9.1 [7.6], p<0.0001), and were less likely to be on antihypertensive therapy (84.5% vs. 92% vs. 100%, p=0.001). Explanatory models (see the Table) revealed limited recognition of cHTN as a “disease” (19.6% vs. 28% vs. 16%, p=0.31) and consistency in the belief that cHTN was curable (44.3% vs. 36% vs. 42%, p=0.62). Stress (48.4% vs. 60% vs. 50%, p=0.31) and, especially at DRH, diet (62.2% vs. 22% vs. 36), p<0.0001) were identified most frequently as causes of cHTN and an association with symptoms was common (83.5% vs. 92% vs. 78%, p=0.15). Clear differences existed for perceived benefits of treatment and consequences of poor control, but both were under-appreciated overall.

**Conclusion:** Misperceptions related to cHTN are common in the ED. While specific areas of disconnect exist by geographic region, under-appreciation of cHTN as a dire and fixed disease state is consistent, suggesting that a uniform educational intervention may be of benefit in this setting.

### Table: Explanatory Model of Hypertension

<table>
<thead>
<tr>
<th>What does it mean to have high blood pressure? (%)</th>
<th>All n=197</th>
<th>DRH n=97</th>
<th>TTCIH n=50</th>
<th>UHWI n=50</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a disease</td>
<td>20.8</td>
<td>19.6</td>
<td>28.0</td>
<td>16.0</td>
<td>0.307</td>
</tr>
<tr>
<td>Elevated pressure</td>
<td>19.3</td>
<td>20.6</td>
<td>18.0</td>
<td>18.0</td>
<td>0.897</td>
</tr>
<tr>
<td>Having a poor diet</td>
<td>13.2</td>
<td>24.7</td>
<td>4.0</td>
<td>0.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Increase of heart rate</td>
<td>16.7</td>
<td>9.3</td>
<td>48.0</td>
<td>0.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Having stress</td>
<td>20.8</td>
<td>27.8</td>
<td>28.0</td>
<td>0.0</td>
<td>0.0001</td>
</tr>
<tr>
<td>Movement of blood</td>
<td>17.7</td>
<td>18.6</td>
<td>16.0</td>
<td>18.0</td>
<td>0.928</td>
</tr>
<tr>
<td>What do you think causes high blood pressure? (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td>45.7</td>
<td>62.9</td>
<td>22.0</td>
<td>36.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Nicotine</td>
<td>8.6</td>
<td>16.5</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0005</td>
</tr>
<tr>
<td>Alcohol</td>
<td>8.1</td>
<td>13.4</td>
<td>4.0</td>
<td>2.0</td>
<td>0.026</td>
</tr>
<tr>
<td>Salt specifically</td>
<td>31.0</td>
<td>33.0</td>
<td>14.0</td>
<td>44.0</td>
<td>0.004</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>21.8</td>
<td>33.0</td>
<td>12.0</td>
<td>10.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Genetic</td>
<td>11.7</td>
<td>12.4</td>
<td>12.0</td>
<td>20.0</td>
<td>0.019</td>
</tr>
<tr>
<td>Endocrine problems</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>2.0</td>
<td>0.228</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>1.5</td>
<td>1.0</td>
<td>0.0</td>
<td>4.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Obesity</td>
<td>9.1</td>
<td>14.4</td>
<td>0.0</td>
<td>8.0</td>
<td>0.023</td>
</tr>
<tr>
<td>Age</td>
<td>2.5</td>
<td>3.1</td>
<td>0.0</td>
<td>4.0</td>
<td>0.304</td>
</tr>
<tr>
<td>Fear</td>
<td>7.6</td>
<td>1.0</td>
<td>6.0</td>
<td>2.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Stress</td>
<td>51.8</td>
<td>48.4</td>
<td>60.0</td>
<td>50.0</td>
<td>0.314</td>
</tr>
<tr>
<td>Other</td>
<td>27.0</td>
<td>32.0</td>
<td>38.0</td>
<td>8.0</td>
<td>0.003</td>
</tr>
<tr>
<td>Can you tell if your blood pressure is elevated? (%)</td>
<td>84.3</td>
<td>83.5</td>
<td>92.0</td>
<td>78.0</td>
<td>0.151</td>
</tr>
<tr>
<td>If so, then how ?(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>40.6</td>
<td>41.2</td>
<td>40.0</td>
<td>40.0</td>
<td>0.98</td>
</tr>
<tr>
<td>Palpitations</td>
<td>16.7</td>
<td>6.2</td>
<td>50.0</td>
<td>4.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Dizziness</td>
<td>23.3</td>
<td>26.8</td>
<td>10.0</td>
<td>30.0</td>
<td>0.032</td>
</tr>
<tr>
<td>SOB/DIB</td>
<td>7.1</td>
<td>9.3</td>
<td>10.0</td>
<td>0.0</td>
<td>0.076</td>
</tr>
<tr>
<td>Chest pain</td>
<td>6.6</td>
<td>4.1</td>
<td>18.0</td>
<td>0.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Nausea</td>
<td>2.5</td>
<td>3.1</td>
<td>4.0</td>
<td>0.0</td>
<td>0.395</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>2.0</td>
<td>3.1</td>
<td>2.0</td>
<td>0.0</td>
<td>0.452</td>
</tr>
<tr>
<td>Back pain</td>
<td>3.0</td>
<td>3.1</td>
<td>2.0</td>
<td>4.0</td>
<td>0.844</td>
</tr>
<tr>
<td>Generalized weakness</td>
<td>19.8</td>
<td>15.5</td>
<td>42.0</td>
<td>6.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Other</td>
<td>35.0</td>
<td>38.2</td>
<td>34.0</td>
<td>28.0</td>
<td>0.398</td>
</tr>
<tr>
<td>Do you think high blood pressure is curable or something you will have all your life? (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curable</td>
<td>41.6</td>
<td>44.3</td>
<td>36.0</td>
<td>42.0</td>
<td>0.623</td>
</tr>
<tr>
<td>What benefits are associated with the treatment of high blood pressure? (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longer Life</td>
<td>17.3</td>
<td>24.7</td>
<td>18.0</td>
<td>2.0</td>
<td>0.002</td>
</tr>
<tr>
<td>Reduced cardiac problems</td>
<td>16.7</td>
<td>21.6</td>
<td>16.0</td>
<td>8.0</td>
<td>0.11</td>
</tr>
<tr>
<td>Decreased healthcare costs</td>
<td>3.0</td>
<td>5.1</td>
<td>0.0</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Increased quality of life</td>
<td>31.5</td>
<td>33.0</td>
<td>30.0</td>
<td>30.0</td>
<td>0.903</td>
</tr>
<tr>
<td>Symptom relief</td>
<td>40.6</td>
<td>33.0</td>
<td>66.0</td>
<td>30.0</td>
<td>0.00</td>
</tr>
<tr>
<td>No benefits</td>
<td>4.6</td>
<td>3.1</td>
<td>6.0</td>
<td>6.0</td>
<td>10.62</td>
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</table>
or 5), compared to an earlier cohort (fiscal year 2000) at the same sites, and the adjusted effect of low priority ED triage on door-to-ECG, door-to-needle, and door-to-balloon time, hospital length-of-stay (LOS), and mortality.

Results: Among 6,784 AMI patients, low priority triage was substantially less frequent than in the earlier cohort, at 33.3% versus 50.3%, respectively. In ST-segment elevation MI (STEMI) patients, it was 25.9%, versus 43.8% in the earlier cohort. Between cohorts, the greatest improvement in triage occurred in patients with chest pain, those seen at higher AMI volume EDs, and in ambulatory patients; patients seen at low AMI volume EDs, diabetics, and the elderly showed the least improvement. Being assigned a low priority triage score was associated with an adjusted increase in median door-to-ECG and door-to-needle time of 12.2 (p<0.001) and 20.7 minutes (p<0.001), respectively, longer than in the earlier cohort (4.4 and 15.1 minutes). It was associated with hospital LOS > 75th percentile (OR 1.25; p<0.001), and higher 90 day (OR 1.50; p=0.02) and 1-year mortality (OR 1.37; p=0.05) in STEMI patients.

Conclusion: Emergency department triage of AMI patients improved significantly over five years. For the third of AMI patients who continue to receive a low priority score, including 25% of STEMI patients, the relative effect on diagnostic and therapeutic delays was greater than previously, and was associated with increased hospital LOS and mortality. Given the effect of this initial, cursory assessment, hospital systems should consider monitoring the quality of their triage.

Background: The current AHA recommendations state that “patients with STEMI should have a portable chest X-ray, but this should not delay implementation of reperfusion therapy (unless a potential contraindication, such as aortic dissection, is suspected) (Level of Evidence: C).”

Objectives: Our objective is to determine if obtaining a chest radiograph (CXR) in the emergency department (ED) delays door-to-balloon (D2B) time in STEMI.

Methods: Design: an IRB-approved retrospective cohort review of all patients who presented to the ED with an electrocardiogram diagnostic for STEMI and underwent emergency cardiac catheterization with percutaneous coronary intervention at an academic medical center from October 2008 to August 2010. Exclusion criteria: trauma, transfer from other hospital, intubation, or cardiac arrest in the ED. Demographic information and key time points were abstracted. ED length of stay (LOS) was defined as triage time to arrival in the catheterization lab. D2B time was defined as triage time to first intervention in the catheterization lab. Descriptive statistics with estimates of errors were calculated using SPSS. Differences were compared using parametric and non-parametric tests.

Results: Eighty-eight patients underwent cardiac catheterization, and 26% had a CXR. The data are presented in Table 1. ED length of stay had a 14 minute delay in patients who underwent CXR (p=0.001) before catheterization. There was a 7 minute increase in D2B time in patients who underwent CXR (p=0.001). Seventy-eight percent of patients who had a CXR achieved the goal of D2B time in less than 90 minutes versus 96% in those who did not have a CXR (p=0.016). None of the CXR revealed acute pathology that changed management.

Conclusion: A chest radiograph is associated with a small but significant time delay in patients undergoing emergency cardiac catheterization for acute STEMI. Significant delays were identified in both ED LOS and D2B times, while no CXR proved to be clinically significant. Obtaining a CXR led to a significant number of patients failing to achieve the 90 minute D2B guideline. Further studies need to be performed to understand if this delay is clinically significant and whether obtaining a CXR affects patient outcomes.

Background: There is a substantial burden of relevant ophthalmoscopic findings in the ED, and the majority of these findings are missed. MAP was the most important determinant of whether a ophthalmoscopic finding during the ED evaluation. Our findings suggest that the blood pressure threshold for hypertensive emergency of DBP=120 is too high to be used as a screening criteria for end organ damage, and that a lower threshold may be more appropriate.

Conclusion: There is a substantial burden of relevant ophthalmoscopic findings in the ED, and the majority of these findings are missed. MAP was the most important determinant of whether a patient would have a missed ophthalmoscopic finding during the ED evaluation. Our findings suggest that the blood pressure threshold for hypertensive emergency of DBP=120 is too high to be used as a screening criteria for end organ damage, and that a lower threshold may be more appropriate.

Background: Our aim was to determine risk factors for the failure to diagnose acute ophthalmoscopic findings in patients presenting to the ED.

Methods: Consecutive, adult patients presenting to the Emory University ED with chief complaint of headache, acute focal neurologic deficit, visual changes, or a diastolic blood pressure (DBP) >= 120 were prospectively enrolled. Photographs of the ocular fundus (optic disc and macula) were obtained from both eyes using a commercially available nonmydriatic oculard fundus camera. ED physicians were masked to the results of the photographs during their care of these patients and were asked to proceed with their routine evaluation of patients. Photographs were reviewed by experts for the presence or absence of ocular fundus abnormalities. The outcome of interest was missed findings defined as the presence of relevant findings not identified during routine care of patients. Presenting complaints, blood pressure (BP), heart rate (HR), height, weight, age, race, sex, and the patients’ ED diagnoses were recorded. Mean arterial pressure (MAP) was calculated from BP and HR. MAP=125 was the exposure of interest. Univariate, stratified, and logistic regression analyses were performed.

Results: Three hundred and fifty patients were enrolled in the study. Forty-four patients (13%) had a relevant abnormality and 27 (61%) of these were missed. Only 7 of the 18 abnormal patients with MAP=125 had DBP=120. Stratified analyses indicated evidence of interaction between MAP and age, BMI, black race, and sex. Logistic regression analyses showed that MAP=125 was the primary, independent risk factor for missed fundus abnormalities (OR 5.18, p<0.001, comparing patients without interacting characteristics) after controlling for age, BMI, race, and sex.

Conclusion: There is a substantial burden of relevant ophthalmoscopic findings in the ED, and the majority of these findings are missed. MAP was the most important determinant of whether a patient would have a missed ophthalmoscopic finding during the ED evaluation. Our findings suggest that the blood pressure threshold for hypertensive emergency of DBP=120 is too high to be used as a screening criteria for end organ damage, and that a lower threshold may be more appropriate.

Implementation of a C-Spine Clearance Protocol by Emergency Department Nurses

Ian G Stieli1, Catherine M. Clement2, Jamie Brehaut2, Jeremy Grimshaw3, Annette O’Connor3, Jeffrey J. Perry3, George A. Wells4, Taryn MacKenzie5, Christine Beland6, Pamela
Background: Prolonged immobilization of minor trauma patients adds to ED congestion and is very uncomfortable for patients.

Objectives: To evaluate the effect and safety of implementing a medical directive allowing nurses to remove the c-spine immobilization of trauma patients judged to be low-risk by a specific c-spine clearance protocol (CCP) that had been previously validated.

Methods: We conducted a prospective cohort study in two large university hospital emergency departments (EDs) and enrolled alert and stable adult trauma patients who presented with neck pain or were immobilized on an emergency medical services (EMS) backboard. ED triage nurses had been trained on the CCP by a CD and hands-on sessions, had to have accurately evaluated 10 patients and 3 interobserver cases, and had passed a written test prior to being certified to clear the c-spine. We evaluated safety and effect from study data forms, imaging records, and 30-day follow-up, using descriptive statistics with 95% CIs.

Results: We enrolled 1,608 patients over 24 months: mean age 42.3 years, motor vehicle collision 59.6%, ambulance arrival 81.3%, admitted 39%, c-spine fracture 1.5%. Overall, 83 nurses participated and removed immobilization from 33.0% (95% CI 30.7–35.3%) of patients and were able to have 24.0% (95% CI 21.9–26.1%) of all cases walk to the ambulatory area of the ED. Nurses were 100% sensitive for identifying patients with c-spine injuries and showed 99.6% agreement with the criterion interpretation of the CCP by the investigators. No patients suffered adverse outcomes or neurologic deficit. In only 4.3% of cases did nurses report uneasiness with application of the CCP.

Conclusion: We have shown the effectiveness and safety of training and empowering ED triage nurses to evaluate and clear the c-spine of alert, stable trauma patients. This strategy should improve patient flow in our crowded EDs, diminish unnecessary patient discomfort, and increase ED nurse decision-making. Future initiatives should address knowledge translation to multiple sites.

110 Comparing Physician Suspicion for Acute Infection in Emergency Department Patients Yields Only Moderate Agreement in a Kappa Analysis

Objectives:

To derive a CDR that is highly predictive of acute orbital trauma.

Methods:

A convenience sample of adult ED patients with acute orbital trauma was evaluated by a treating physician from 4/28/2009 to 10/28/2009 at Jacobi Medical Center, an urban, academic Level I trauma center with 70,000 annual ED visits. Six RPs (ED attending and resident physicians) enrolled patients and performed their evaluations separate from the treating physician evaluation. Written consent was obtained and a history and physical exam were performed by the RP. The RP then documented the SFI (yes/no) on a data form immediately after their encounter with the patient. Treating physicians were blinded to the RP’s assessment. The treating physician documented his or her SFI (yes/no) in a mandatory computer query at the time of the initial CBC order. De-identified data recorded by the treating physician was then provided to us by the Information Technology Department. A kappa coefficient was calculated.

Results: One hundred and forty patients were consented and enrolled. Physicians agreed on SFI for 114/140 patients (81.4%, K 0.50, p<0.0001). The percentage agreement above chance between an RP and a treating physician was moderate.

Conclusion: In our sample, agreement on the SFI between an RP performing a history and physical exam and a treating physician initiating the patient’s care was only moderate, suggesting that an important component of sepsis surveillance and research enrollment is inconsistently recognized. Further research should focus on evaluating and improving this first step in ED sepsis management.

111 Derivation of a Clinical Decision Rule for Computed Tomography After Orbital Trauma

Objectives:

To derive a CDR that is highly predictive of acute orbital fracture in ED patients presenting with acute orbital trauma.

Methods:

A convenience sample of adult ED patients with acute orbital trauma was evaluated by a treating physician from 4/28/2009 to 10/28/2009 at Jacobi Medical Center, an urban, academic Level I trauma center with 70,000 annual ED visits. Six RPs (ED attending and resident physicians) enrolled patients and performed their evaluations separate from the treating physician evaluation. Written consent was obtained and a history and physical exam were performed by the RP. The RP then documented the SFI (yes/no) on a data form immediately after their encounter with the patient. Treating physicians were blinded to the RP’s assessment. The treating physician documented his or her SFI (yes/no) in a mandatory computer query at the time of the initial CBC order. De-identified data recorded by the treating physician was then provided to us by the Information Technology Department. A kappa coefficient was calculated.

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Background: Significant variation and inefficiency exist in ordering computed tomography (CT) imaging for detecting orbital fractures in patients presenting with acute orbital trauma. Clinical decision rules (CDRs) can help improve diagnostic accuracy, decrease resource utilization, and limit exposure of radiosensitive organs (such as the globe) to ionizing radiation.

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Methods: Prospective cohort study conducted from July 2007–October 2009 at two urban hospitals. Consecutive patients with acute orbital trauma undergoing CT were enrolled using a mandatory electronic data collection instrument (EDCI) integrated into the computerized order system. Physicians evaluated patients on 15 clinical findings prior to CT. The main outcome was any acute orbital bone fracture identified in the final CT report. The CDR was derived using multivariate logistic regression with multiple imputation to determine which findings were most predictive for acute orbital fracture.

Results: Of 3,123 EDCIs completed, 2,549 (81.6%) were for patients suffering traumatic injury. Compliance with the EDCI was high (95.0%) resulting in 2,422 complete forms. For EDCIs with missing data, we used multiple imputation so that all surveys could be used for CDR derivation. Median age was 39 with male predominance (68.8%). CT results were available for all patients, with 408 (16.0%) having acute orbital fractures. Majority of injuries were caused by fist to orbit (36.7%) or fall (32.9%). The CDR with the highest predictive value was selected; cross-validation and regression diagnostics were performed to ensure calibration and confirm model fit. Patients lacking any of the equally-weighted six exam findings (Table 1) had a 6.4% (95% CI 4.7–8.4) prevalence of acute orbital fracture. Patients with four or more exam findings had a fracture prevalence of 44.7% (Figure 1).

Conclusion: The CDR derived in this study identifies six exam findings highly predictive for acute orbital fracture; however, with a prevalence of 6.4% in the 0 score group, the CDR is not sufficiently sensitive to “rule out” fracture. Subsequent study using fractures of clinical importance as the outcome may yield a more sensitive CDR.

Table 1: Orbital Fracture Risk Score

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Regression Coefficient</th>
<th>Risk Score</th>
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<tbody>
<tr>
<td>Orbital rim tenderness</td>
<td>0.50</td>
<td>1</td>
</tr>
<tr>
<td>Periorbital edema</td>
<td>0.73</td>
<td>1</td>
</tr>
<tr>
<td>Subconjunctival hemorrhage</td>
<td>0.59</td>
<td>1</td>
</tr>
<tr>
<td>Pain with extraocular movement</td>
<td>0.50</td>
<td>1</td>
</tr>
<tr>
<td>Impaired extraocular movement</td>
<td>0.64</td>
<td>1</td>
</tr>
<tr>
<td>Epistaxis</td>
<td>0.50</td>
<td>1</td>
</tr>
</tbody>
</table>

112 Underuse of Clinical Decision Rules and D-dimer Testing in the Evaluation of Patients Presenting to the Emergency Department With Suspected Venous Thromboembolism

Amanda Crichlow, Adam Cuker, Asako C. Matsuura, and Angela M. Mills
University of Pennsylvania, Philadelphia, PA

Background: Validated clinical decision rules and D-dimer testing have been shown to decrease unnecessary imaging studies in emergency department (ED) patients with suspected acute venous thromboembolism (VTE). However, use of these algorithms varies.

Objectives: We sought to determine the proportion of imaging studies and D-dimer testing for acute VTE that are performed on low-risk patients in an academic ED.

Methods: A retrospective cohort of patients with febrile neutropenia who visited the ED of a tertiary medical hospital during Jan 2008 to Dec 2008 was identified by reviewing the electronic patient record system. Only episodes of febrile neutropenia caused by chemotherapy for underlying cancer were included. Clinical variables available at the ED were collected. Serious complications during hospitalization were defined as unstable hemodynamic status, respiratory distress, altered mental status, newly-developed arrhythmia which acquired intervention, and death. Univariate analysis of the association between each potential predictor and serious complications was performed. All variants with p-values were diagnosed with PE (0%, 95% CI 0.0–0.23). Of the 152 suspected PE subjects, 96 (69.5%) did not meet PERC but had a low-risk Wells score for PE (< 4), of whom only 31 (23.3%) underwent D-dimer testing (elevated in 28/31). Of the 96 subjects who did not meet PERC but had a low-risk Wells score for PE, 8 (9.2%, 95% CI 0.4–0.17) were diagnosed with PE. Of 85 suspected DVT subjects (mean age 54.2 ±18.0 years, 49% female, 59% black, 24.7% diagnosed with DVT), the Wells score for DVT was low-risk (< 1) in 46 patients (54%), of whom only 3 (6.5%) received a D-dimer assay (elevated in all). Of the 46 low-risk patients, 4 (8.7%, 95% CI 0.02–0.21) were diagnosed with DVT.

Conclusion: The use of validated diagnostic algorithms would have reduced the use of CT in 9% (14/152) of suspected PE by using the PERC algorithm. In 65% (65/96) of suspected PE patients who did not meet PERC but had low-risk Wells, and 93% (43/46) of suspected DVT patients who had low-risk Wells, D-dimer was not obtained as recommended by validated algorithms and could have potentially avoided imaging studies in these patients. D-dimers are currently being performed on a research blood specimen drawn at the time of enrollment to define the precise proportion of imaging that would have been avoided by algorithm adherence.

113 Prediction of Developing Serious Complication During Hospitalization for Patients With Chemotherapy-related Febrile Neutropenia in the Emergency Department

Juin-Jen Lynn, Kuan-Fu Chen, Yi-Ming Weng, and Te-Fa Chiu
Chang Gung Memorial Hospital, Taoyuan, Taiwan

Background: Febrile neutropenia caused by chemotherapy is a medical emergency in emergency department (ED) patients. However, it had been suggested that the patients with febrile neutropenia are a heterogeneous group with different severity.

Objectives: The purpose of this study is to identify the independent factors that could predict the development of serious complications in patients with febrile neutropenia presenting to the ED.

Methods: A retrospective cohort of patients with febrile neutropenia who visited the ED of a tertiary medical hospital during Jan 2008 to Dec 2008 was identified by reviewing the electronic patient record system. Only episodes of febrile neutropenia caused by chemotherapy for underlying cancer were included. Clinical variables available at the ED were collected. Serious complications during hospitalization were defined as unstable hemodynamic status, respiratory distress, altered mental status, newly-developed arrhythmia which acquired intervention, and death. Univariate analysis of the association between each potential predictor and serious complications was performed. All variants with p-values
Background: Diagnosing diabetic ketoacidosis (DKA) has traditionally required a venous blood gas (VBG) to obtain serum pH and a chemistry panel to obtain electrolyte values. Since newer blood gas analyzers have the ability to report electrolyte values in addition to pH, this diagnostic process could theoretically be reduced to just one test. However, the degree of agreement between the VBG electrolytes and the serum chemistry electrolytes, including sodium, chloride, and bicarbonate, has not yet been evaluated in the context of acute hyperglycemia.

Objectives: The purpose of this study was to assess the accuracy of the venous blood gas (VBG) as a stand-alone blood test for diagnosing DKA, and to describe the correlation between VBG and serum chemistry electrolytes in a sample of hyperglycemic patients seen in the emergency department (ED).

Methods: We prospectively identified a convenience sample of ED patients with serum blood glucose ≥250 mg/dL, and examined their paired VBG electrolytes and serum chemistry electrolytes. The diagnosis of DKA was made by using American Diabetes Association criteria including: serum glucose ≥250 mg/dL, serum anion gap ≥10 mEq/L, carbon dioxide ≤18 mEq/L, serum pH ≤7.30, and presence of ketosis. Serum chemistry electrolytes were considered to be the criterion standard. Diagnostic test characteristics of VBG electrolytes including sensitivity and specificity were compared against the standard. In addition, correlation coefficients for individual electrolytes and anion gap were calculated.

Results: Pairwise VBG and serum chemistry panels were available for 342 patients, of whom 46 (13.5%) had DKA. The specificity and sensitivity of the VBG alone for diagnosing DKA were 97.8% (95% CI 88.5–99.9%) and 100% (95% CI 98.8–100%), respectively. One case of DKA was missed by the VBG. Correlation coefficients between VBG and serum chemistry were 0.90, 0.73, 0.94 and 0.81 for sodium, chloride, bicarbonate, and anion gap, respectively.

Conclusion: The VBG electrolytes were 97.8% sensitive and 100% specific for the diagnosis of DKA in hyperglycemic patients. These results suggest that VBG electrolytes may be used in lieu of serum chemistry electrolytes for the diagnosis of DKA. These findings should be validated in a larger trial prior to widespread implementation.
each, and two liters of saline were infused. We assessed bilateral internal jugular and femoral veins (for a total of 32 post-infusion measurements) pre- and post-infusion. Measurements of vessel dimensions were made using a high-resolution linear ultrasound probe and the associated calipers on the machine. Residents then attempted to cannulate the venous targets.

**Results:** The right internal jugular vein calculated mean pre-infusion (pre-CSA) was 0.54 cm² (0.2-1.05 cm²), and the mean post-infusion (post-CSA) was 2.20 cm² (0.86 to 3.56 cm²), resulting in a percent increase of 351%. The left femoral vein calculated mean pre-CSA was 0.92 cm² (0.01 to 1.82 cm²), and the mean post-CSA was 1.69 cm² (0.64-2.73cm²), resulting in a percent increase of 184%. The left femoral vein calculated mean pre-CSA was 0.76 cm² (0.18-1.34 cm²), and the mean post-CSA was 1.23 cm² (0.55-19.1 cm²), resulting in a percent increase of 161%. 27/32 (84%) venous targets were successfully cannulated.

**Conclusion:** This study shows that infusion of saline increases the size of the internal jugular and femoral veins in unembalmed cadavers. This increases the venous target size for ultrasonography-guided central lines and improves this vascular model for teaching central venous catheterization.

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**117 Increased Mentored Resident Research Through Changes in the Academic and Research Environment - ScholarQuest**

Ashish R Panchal, Uwe Stolz, Benson Munger, Kurt Denninghoff, and Samuel M Keim

*University of Arizona, Tucson, AZ*

**Background:** The ACGME requires that residents perform scholarly activities prior to graduation. This requirement is often difficult to fulfill, and offering an original research experience during residency is challenging.

**Objectives:** We describe a single-department residency research program which takes advantage of changes in the academic and research environment aligning faculty and departmental goals to produce a strong educational and research instrument.

**Methods:** A research program, ScholarQuest, was implemented in 2005 as a key part of a structured 3-year emergency medicine Information Mastery program. The goal of ScholarQuest is for residents to acquire an understanding of scholarly activity through a directed experience in original research. This was facilitated by providing protected time to learn research methodology, prepare research hypotheses, and define research plans with guidance of research mentors. These activities were supported through seed grants and statistical and ancillary staff support. We evaluated total completed scholarly activity and resident/faculty involvement from 2003-2010 both pre-intervention (PRE-SQ: 2003 - 2005) and post-intervention (POST-SQ: 2007 - 2010). We did not include program run-in period in analysis. We tabulated data from all types of scholarly activities. Statistical analysis: Wilcoxon rank sum test and negative binomial regression using STATA v11.1.

**Results:** The total number of scholarly activities was significantly greater POST SQ versus PRE SQ groups (123 versus 27, respectively, p<0.05). The annual incidence rate of completed scholarly activity per resident was 0.33 for PRE SQ and 0.77 for POST SQ. The annual incidence rate ratio (IRR) for scholarly activity per resident was 2.35 (CI 1.05 to 5.30, p<0.05). There was also a significant increase in resident involvement (22 to 98 residents, p < 0.05) along with an increase in faculty involvement (10 to 39, p < 0.05). The annual IRR for resident and faculty involvement controlling for growth of residency and faculty was 2.87 (CI 1.79 to 4.60, p < 0.05) and 2.69 (CI 1.34 to 5.38, p < 0.05), respectively.

**Conclusion:** Implementation of a program utilizing departmental environmental change promoting resident research yielded increased resident and faculty involvement. This was associated with increased total scholarly activity following implementation of the program.
Background: We analyzed 20 years of National Resident Match Program (NRMP) data pertaining to the emergency medicine (EM) applicant pool, number of positions offered, program fill rate, applicant pool composition and match rate, and the proportion of the EM match to the entire NRMP match.

Objectives: We hypothesized that the applicant pool, number of EM positions offered, and the proportion of the EM match to the NRMP match increased linearly over time, and that the proportion of U.S. seniors matching in EM remained stable over time.

Methods: Twenty years of data from the annual NRMP Data Books (1991–2010) were organized in tabular and graphic formats, and analyzed for trends over time.

Results: Over 20 years, there was an increased supply in entry level positions into EM residency training (2-6% per year), with corresponding demand for these positions by applicants. The rate of growth of supply and demand varied from year to year, but, in general, have tracked closely together. Occasionally, there are years where growth in supply of positions exceeds demand for them (“buyers years”, such as 1991 (#3 on x axis, lower graph) and 1998 (#10 on x axis), and other years where growth in the demand for positions exceeds the supply of them (“sellers years”, such as 1996 (#8 on x axis) and 2000 (#12 on x axis)). These occasions were isolated and corrected within 1–2 years. Because of the relationship between supply and demand, the percent of EM unfilled positions and the percent of U.S. seniors unmatched trended in opposite directions (square and triangle lines in lower graph). The proportion of EM positions filled by U.S. seniors (approximately 75–80%) versus other types of applicants has remained stable year to year. The unmatched rate for U.S. senior applicants has remained low (6–7%), suggesting that most U.S. seniors can be advised of a favorable outcome in the EM match.

Conclusion: The above trends are apparent within NRMP data. The tracking of the supply of EM positions with the demand for them has been fortuitous for both applicants and programs. However, the growth of both entities are based on different factors (increasing volume of ED visits for supply of positions, versus increasing student exposure to EM faculty for demand) that are seemingly unrelated. Given the growth in EM academic units, programs, and the applicant pool, this tracking is likely to continue for some time, but the reasons for tracking are unclear (potentially serendipitous), and this relationship could change in the future.

Background: A total of 68/83 (82%) residents responded. Surgery residents, 4.42 (95% CI 3.98–4.80), had a significantly higher confidence level when placing CVCs using anatomical landmarks compared to EM residents, 2.81 (95% CI 2.46–3.16), p<0.01. Surgery residents were more confident in the placement of CVCs using anatomical landmarks than EM residents in each of the following years: femoral CVC site, surgery residents, 4.63 (95% CI 4.30–4.96) vs EM residents, 3.5 (95% CI 3.07–3.93), p=0.002; internal jugular site, surgery residents, 3.47 (95% CI 3.29–3.67) vs EM residents, 1.69 (95% CI 1.34–2.04), p<0.01; and subclavicular site, surgery residents, 4.42 (95% CI 3.93–4.91) vs. EM residents, 3.32 (95% CI 2.88–3.76), p=0.006.

Conclusion: Surgery residents are significantly more confident in placing CVCs using anatomical landmarks than their EM resident colleagues. This emphasizes the potential need for additional EM resident education on anatomical landmark techniques for CVC placement.

Background: We analyzed 20 years of National Resident Match Program (NRMP) data pertaining to the emergency medicine (EM) applicant pool, number of positions offered, program fill rate, applicant pool composition and match rate, and the proportion of the EM match to the entire NRMP match.

Objectives: We hypothesized that the applicant pool, number of EM positions offered, and the proportion of the EM match to the NRMP match increased linearly over time, and that the proportion of U.S. seniors matching in EM remained stable over time.

Methods: Twenty years of data from the annual NRMP Data Books (1991–2010) were organized in tabular and graphic formats, and analyzed for trends over time.

Results: Over 20 years, there was an increased supply in entry level positions into EM residency training (2-6% per year), with corresponding demand for these positions by applicants. The rate of growth of supply and demand varied from year to year, but, in general, have tracked closely together. Occasionally, there are years where growth in supply of positions exceeds demand for them (“buyers years”, such as 1991 (#3 on x axis, lower graph) and 1998 (#10 on x axis)), and other years where growth in the demand for positions exceeds the supply of them (“sellers years”, such as 1996 (#8 on x axis) and 2000 (#12 on x axis)). These occasions were isolated and corrected within 1–2 years. Because of the relationship between supply and demand, the percent of EM unfilled positions and the percent of U.S. seniors unmatched trended in opposite directions (square and triangle lines in lower graph). The proportion of EM positions filled by U.S. seniors (approximately 75–80%) versus other types of applicants has remained stable year to year. The unmatched rate for U.S. senior applicants has remained low (6–7%), suggesting that most U.S. seniors can be advised of a favorable outcome in the EM match.

Conclusion: The above trends are apparent within NRMP data. The tracking of the supply of EM positions with the demand for them has been fortuitous for both applicants and programs. However, the growth of both entities are based on different factors (increasing volume of ED visits for supply of positions, versus increasing student exposure to EM faculty for demand) that are seemingly unrelated. Given the growth in EM academic units, programs, and the applicant pool, this tracking is likely to continue for some time, but the reasons for tracking are unclear (potentially serendipitous), and this relationship could change in the future.

Background: Assistant and associate residency program directors (APDs) play an important role in the successful running of an emergency medicine (EM) residency program, but there are no standard job descriptions, job requirements, or required salary support.

Methods: A voluntary, anonymous, on-line survey approved by the Weill Cornell Medical College IRB was sent to the Council of Emergency Medicine Residency Directors list serve on three occasions in November 2010. Residency programs with a zero response rate were contacted via email or phone call and invited to participate.

Results: These are preliminary results. Of 167 United States EM residency programs listed in the Society of Academic Medicine residency catalog, at least one APD responded from 130 programs (77.5%); three programs had no APDs. A total of 172 APDs responded, for an average of 1.32 per program. Characteristics of APDs: 38.2% are female, 67.5% are between the ages of 31–40, 82.3% are white, and 8.3% are of Spanish origin. All APDs have completed an EM residency, with 56% having served as a chief resident. Eight APDs have completed dual training (7 EM/IM, and 1 EM/Peds). The majority, 87.7%, are either hospital or university employees. Only 17.8% are on a tenure track. Academic ranks are 0.6% professors, 22.2% associate professor, 65.1% assistant professor, and 4.2% instructors. Average time practicing EM is 7.3 years. The majority, 53.3%, are associate PDs with an average of 3.09 years in that role and 44.9% serving as assistant PDs first. Assistant PDs have been in their role an average of 2.91 years. As a requirement of their APD role, 38.6% participate in medical student/school responsibilities, and 11.2% as a fellowship or specialty area director. Sixty percent of APDs had a strong desire or desire to become a program director, dean 21%, or department chair 21.1%, not mutually exclusive. Their average salary is $216,156 with 70.9% receiving no additional compensation for their role as APDs.

Conclusion: This survey helps to quantify the basic demographic, compensation, and job responsibilities of APDs in EM.
A better understanding of these factors will help academic emergency departments with the career development and support of APDs.

(Originally Submitted as a Late-breaker)

122 Inadequate Baseline and 6-month Retention of the Emergency Severity Index by Experienced Emergency Department Registered Nurses
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Background: The use of the Emergency Severity Index (ESI) for clinical evaluation of emergency patients in the United States is widespread. Although initially developed for clinical triaging of individual patients, ESI scores are now used for multiple purposes (e.g., research using aggregate patient data, operational assessments of emergency departments [EDs]). To date, there is no study examining previously trained experienced ED nursing staff knowledge of ESI, or their retention ability after retraining.

Objectives: To evaluate the baseline knowledge and the ability of ED RNs to retain knowledge of ESI at 6-months after retraining session.

Methods: With IRB approval, previously ESI-trained RNs with current ED experience completed a 30-item pre-test on the knowledge of ESI. All participants then completed a 2-hour AV session with the educational material published by the Agency for Healthcare Research and Quality (AHRQ) followed by a second 30-item post-test. Six months after the retraining session, the nurses completed an online 30-item retention test. All tests consisted of the questions provided in the AHRQ material. The nurses continued to work in EDs using ESI during that time period. Comparisons were conducted with pre-, post-, and 6-month test results using repeated measures ANOVA, controlling for age and years of experience.

Results: Mean pre-test score for the 27 participants was 65% correct (95% CI 60.23, 70.44), which was significantly lower than the mean post-test score of 80% (95% CI 77.65, 83.17) (p < 0.0001). The mean post-test retention score was 65% (95% CI 60.05, 70.10), which was different from the pre-test score for this cohort (p = 0.19). These results were consistent when controlling for age and years of experience of the provider.

Conclusion: Emergency department RNs with previous ESI training and clinical experience had inadequate baseline performance (pre-test), essentially returning to their baseline performance. Our results suggest the current ED RN's knowledge of ESI may be inadequate but can improve with retraining. Non-sustained and suboptimal performance of ED RNs at 6 months after retraining indicates a need for regular and frequent review of the ESI material.

124 The Mini Clerkship: Exposing Pre-clinical Medical Students to Emergency Medicine
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Background: Several studies indicate an inadequate exposure to emergency medicine (EM) within US medical schools. This can be partially attributed to only 36% of medical schools requiring students to participate in an EM rotation. Other schools only offer EM as a senior elective.

Objectives: We hypothesized that a preclinical EM experience would not only increase a student's self-assessed level of familiarity to EM, but also increase the likelihood of the student considering EM as an elective and/or career.

Methods: We created an easily reproducible EM experience for pre-clinical students designed to increase both exposure to the scope of EM and familiarity with common EM procedures such as suturing, ultrasound, intubation, and central line placement. All first and second-year medical students at the University of Alabama at Birmingham were invited to participate. The students took a pre-participation survey so that we could understand the role of emergency physicians, and if the student was interested in the scope of EM and familiarity with common EM procedures such as suturing, ultrasound, intubation, and central line placement. All procedures were taught the EM OCP (37%), that their instruction was consistent (30%), or that expectations of the EM OCP were clear (21%). Respondents felt brief instruction during their orientation (60%) and reading with a portable summary card (48%) would improve their EM OCP skills. Fewer respondents felt an asynchronous online module (22%) or an audio podcast (19%) would be helpful.

Conclusion: Students understand that learning the EM OCP is an important aspect of their clerkship and identify a need for additional specific and consistent teaching. Based on these findings, the next step would be to develop brief, accessible, and effective teaching strategies to guide learning of the EM OCP.

123 Attitudes of Medical Students on Their Instruction of the Emergency Medicine Oral Case Presentation
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Background: The oral case presentation in emergency medicine (EM OCP) is distinct from that of other specialties. The EM OCP is the clinician's communication tool to justify whether immediate or urgent intervention is required, to argue for ruling out emergent disease states, and to propose a safe disposition plan in the context of triaging multiple patients for medical care and prioritization of emergency department and hospital resources. Since the EM OCP is important to teach students about the practice of EM, we need to determine students' perceptions of the current level of effectiveness of this instruction.

Objectives: The objective of this study is to document the attitudes of medical students on their instruction of the EM OCP.

Methods: We surveyed medical students from five institutions towards the end or after their EM clerkship from July to November 2010. The survey had 14 items using a five point Likert scale. Analysis included descriptive statistics. All five sites obtained IRB approval for this study.

Results: One hundred and thirty-nine (80% response rate) students completed the survey. Most medical students reported the EM OCP to be unique compared to that of other medical disciplines (86%) and integral to their EM clerkship evaluation (78%). Students (78%) felt additional teaching was required beyond their current medical school instruction. A minority reported being specifically taught the EM OCP (57%), that their instruction was consistent (30%), or that expectations of the EM OCP were clear (21%). Respondents felt brief instruction during their orientation (60%) and reading with a portable summary card (48%) would improve their EM OCP skills. Fewer respondents felt an asynchronous online module (22%) or an audio podcast (19%) would be helpful.

Conclusion: Students understand that learning the EM OCP is an important aspect of their clerkship and identify a need for additional specific and consistent teaching. Based on these findings, the next step would be to develop brief, accessible, and effective teaching strategies to guide learning of the EM OCP.
Objectives: To characterize variability in the IRB process in a multi-site study with educational research involving residents.

Methods: We examined the Pennsylvania Trauma Foundation database to see how many cricothyrotomies (CT), tube thoracostomies (TT), and emergency thoracotomies (ET) were reported each year. To determine if the AO or the TOCP is the more comprehensive but time consuming; is an "up front" assessment-oriented style (AO OCP) more appropriate in the emergency department (ED) setting?

Results: There were a total of 17 emergency medicine residency programs in the state with a total of 515 residency positions available. Nine of the programs are allopathic programs and eight of the programs are AOA-certified. A total of 5,343 TTs, 150 CTs, and 472 ETs were reported at Level I and II trauma centers during the 5 years under consideration. There was an annual mean of 1,069 TTs, 30 CTs and 94 ETs over the 5 years. The ACGME RRC for EM requires that each resident perform at least 10 TTs and 3 CTs over the course of their training. If we assume that the ACGME RRC requirements apply equally to all residency programs and that a resident will do an equal fraction of the required number each year, then we would need 1,540 TTs and 462 CTs available annually. Trauma care can provide only about 69% of needed TT and 6% of needed CT experiences required. There is on average about one ET available per EM resident during the whole residency.

Conclusion: There are not enough TT and CT opportunities available in the state of Pennsylvania for all of the EM residents to fulfill their procedural requirements without the use of animal labs and/or medical simulation. These numbers are upper bounds on the number of procedures for residents since some of these opportunities may be taken by attending physicians and residents of other specialties.

Assessment-Oriented Vs Traditional Oral Case Presentations in the Emergency Department: Efficiency, Effectiveness, Satisfaction, and the Effects of Interruptions

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Background: The traditional oral case presentation (TOCP) is comprehensive but time consuming; is an “up front” assessment-oriented style (AO OCP) more appropriate in the emergency department (ED) setting?

Objectives: To determine if the AO or the T OCP is the more efficient, effective, and physician-preferred style in the ED setting, and assess the effect of interruptions on AO vs T OCP timing and satisfaction of the resident and attending physicians.

Methods: Prospective study in an academic teaching hospital ED July-August 2010. Participants were 11 full-time attending physicians (APs) and 24 emergency medicine resident physicians (RPs). RPs were trained in AO style and were free to choose which format to use; each OCP was voice-recorded, timed, and teaching moments were counted; interruptions were documented and timed. Immediately post OCP, the RPs and APs evaluated the organization, adequacy of data reported, quality of medical decision-making (MDM), and overall satisfaction with the OCP using a 7 point Likert scale. The type of OCP and number of clinical data points per OCP were determined by later review of each recording. Chi-square analysis was performed with STATAv.10.

Results: One hundred and eight presentations were recorded, 73 T and 35 AO OCP. The mean length, including interruptions of T OCP was 175 seconds vs 89 seconds for the AO style (p<0.005). APs asked clarification questions more often during T OCP (p<0.005), but explored didactic teaching moments equally often with both styles (p = 0.17). Though the RPs gave more clinical details using T OCP (p<0.001), APs rated the two styles as equally organized (p = 0.541) and satisfying (p = 0.798), and felt that both styles gave sufficient information to consider all diagnostic considerations (MDM) (p = 0.681). Though RPs felt the formats were equal in relevant information (P = 0.95), they felt more organized (p<0.05) and satisfied (p<0.04), and rated their confidence level higher when using the AO OCP (p<0.001). T OCP were interrupted 25 of 73 (34%), A OCP 7 of 28 (25%), not statistically different (p = 0.08). However, the satisfaction of RPs was significantly affected by interruptions during T OCP (p<0.05).

Conclusion: The AO OCP allows ED physicians to more rapidly communicate with one another while maintaining AP satisfaction with organization, information exchange, and MDM, increasing overall RP satisfaction, preserving teaching moments, and minimizing the effects of interruptions.
128 Educational Effectiveness of Emergency Medicine Resident-Attending Physician Patient Care Teams

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Background: The educational effects of pairing an emergency medicine (EM) resident and attending physician as a patient care team have not previously been evaluated.

Objectives: We hypothesized that no difference in educational effectiveness would exist in comparing a resident-attending team to the standard approach of a resident reporting to multiple available attendings.

Methods: A prospective cohort study was conducted at a university, tertiary referral hospital with 21 PGY1-3 residents. The two-month control period (July, Aug) was compared to the two-month team-reporting period (Sept, Oct). Differences in self-reported ACGME core competency and procedural teaching effectiveness were evaluated using logistic regression. The rates of completed performance feedback forms and the number of patients treated by residents per hour were evaluated using Poisson regression.

Results: The total number of emergency department (ED) patients treated by residents during the standard and team periods were 5793 and 5429, respectively (p<0.001), reflecting decreased patient volume. There were no significant differences in attending availability and quality of educational opportunities as reported by both attending and residents (p>0.05). The self-reported ACGME core competency and procedural teaching effectiveness also remained the same using the standard and team approaches (p>0.05). The number of written evaluations of attending physicians completed by residents increased from 68% to 86% (p<0.001) during the standard and team periods. Of these, the number of evaluations with substantive feedback decreased from 8% to 4% (p = 0.069). Written evaluations of residents completed by attending physicians decreased from 68% to 36% (p<0.001) during the standard and team periods. Of these, the number of evaluations with substantive feedback increased from 40% to 53% (p = 0.050). The number of patients per hour treated by residents decreased from 1.57 to 1.44 (p<0.001). The total number of procedures documented by residents decreased from 272 to 240 (p = 0.157).

Conclusion: The implementation of a resident-attending physician patient care team did not change the self-reported clinical educational opportunities. Team-reporting increased the number of attending evaluations by residents and decreased the number of resident evaluations by attendings. However, substantive comment feedback by attendings for residents increased. (Originally Submitted as a “Late-breaker”)

129 FAST Exams By Residents: How Many Determine Competence?

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Background: The Focused Assessment with Sonography in Trauma (FAST) exam is performed by a resident at most academic emergency departments (EDs).

Objectives: We hypothesized that the percent of bedside FAST exams determined to be a technically limited study (TLS) would be related to whether or not residents exceeded recommended thresholds of 10 and 25 prior exams.

Methods: We conducted a prospective observational study in the ED of an 80,000 annual visit Level 1 trauma center. The study population was all residents in the ED who had performed > 10 FAST exams over an 18 month intake period. To avoid selection bias we included all FAST exams. The adjudication of TLS was performed by certified US faculty. Based on cited recommendations to achieve competency, we grouped the predictor variable study number into <10, 10–25, and 26+ prior studies performed. We also included post-graduate year (PGY) and specialty in our model. To account for the clustering of data by resident, we used a generalized estimating equation logistic regression to perform a multivariable analysis (MVA).

Results: We reviewed and analyzed 1468 studies performed by 43 residents. The median number of studies performed by each was 29 (range 15–96, IQR 20.5–42.5). Studies were performed by emergency medicine (EM) (20%) and surgery (80%) residents. Overall TLS rate was 38%. MVA revealed that studies performed by residents with <10 prior studies were 1.87 (95% CI 1.14–3.06, p = 0.01) times more likely to be TLS than studies performed by residents with >25 prior studies. Studies performed after 10–25 study experience were 1.20 (CI 0.79–1.84, p = 0.35) times more likely to be TLS. Surgery residents were 1.41 (CI 0.87–2.28, p = 0.17) times more likely to have a TLS compared to EM residents. Compared to PGY-3, PGY-1 residents were 0.48 (CI 0.19–1.22, p = 0.12) times as likely to have a TLS.

Conclusion: At a single site academic ED, residents performed an uninterpretable FAST exam more than one-third of the time. Compared to residents who had previously performed 25+ exams, residents who had performed <10 were almost twice as likely to produce scans that were TLS. There was no improvement after 10–25 prior scans. PGY and specialty were not predictors of performing a TLS. Limitations include possible confounders not included in our model and potential non-generalizability of a single site study.

130 The Effect of an Audience Response System on Faculty Evaluations of Emergency Medicine Residents

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Background: The American College of Graduate Medical Education (ACGME) requires that residents receive formative evaluations in each of the six core competencies. Beyond requiring that the assessment be objective, the ACGME does not offer guidance as to how to obtain the data.

Objectives: To determine whether changing the format of faculty evaluations of emergency medicine (EM) residents from an open discussion to an anonymous process using an audience response system (ARS) improves the content of the evaluation.

Methods: This was a retrospective review of EM resident global evaluations performed by the EM faculty at a single academic medical center from July 2008 to June 2010. Prior to July 2009, faculty evaluated residents during faculty meetings through open discussion (OD). A faculty scribe recorded the opinions of multiple faculty members and assigned the resident a consensus score for each of the six ACGME core competencies. Beyond requiring that the assessment be objective, the ACGME does not offer guidance as to how to obtain the data.

Results: Emergency medicine faculty evaluated 58 individual residents and completed 120 assessments (n=64 [OD], n=53 [AR]). In all six core competencies, the ARS format trended to a lower mean score and a regression of scores towards the mean, with a significant difference in four of the competencies. Additionally, the mean length of narrative per evaluation decreased (64 words [OD] vs 45 words [AR] p = 0.005).

Conclusion: Faculty adoption of anonymous ARS evaluations of EM residents increases overall accuracy of assessment by reducing the clustering of scores around the mean. However, the reduction in narrative comments requires further study.
131 Feedback in Emergency Medicine Clerkships: Is It Happening and Do Medical Students Expect It?

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**Background:** Effective feedback is an essential part of learning in medical school clerkships, but there are potential barriers to giving and receiving feedback, including time pressure, perceived emotional valence, and potential negative impact on the teacher-learner relationship. Additionally, shift work in the emergency department (ED) may challenge the development of teacher-student relationships that inform meaningful feedback discussions. These challenges have not been examined in terms of emergency medicine (EM) clerkships, which are short in duration and have little repeat attending physician contact.

**Objectives:** To clarify medical student feedback expectations and experiences during a 4th year clerkship in EM.

**Methods:** After IRB approval, 64 consecutive 4th year students anonymously completed a Likert scale (1 - 5) survey reporting their feedback expectations and experiences at the end of a 4 week EM rotation in a tertiary care academic ED. Standard descriptive statistics were performed.

**Results:** Students reported ‘strongly agreed’ or ‘agreed’ as follows: 85% expected verbal feedback; 82% received adequate feedback from attendings; 79% reported that feedback helped them to improve their skills. Only 25% reported that they felt uncomfortable receiving feedback, while 53% strongly agreed or agreed that receiving feedback influenced their evaluation of an attending; in 100% of these cases, receiving feedback from an attending had a positive impact on a student’s evaluation of an attending.

**Conclusion:** Despite the perceived challenges to feedback discussions in the ED, in this pilot study most 4th year medical students expected and received feedback and found it useful for improving their clinical skills. Most students did not report feeling uncomfortable receiving feedback in this setting, and had a positive impression of attendings who took the time to give effective feedback. These findings indicate that many students are emotionally prepared to receive feedback and that it can enhance teacher-learner relationships, even in a busy, shift-work environment.

132 Short- and Long-term Knowledge Retention Among Physicians Completing an Internet-based Didactic on Carbon Monoxide Poisoning and Methemoglobinemia

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**Background:** The internet is growing in use as a means for graduate, post-graduate, and continuing medical education. However, most emergency department residency programs rely on live lectures for trainee instruction. Internet didactics may be delivered to more learners and require less learner time without sacrificing educational outcomes.

**Objectives:** To determine immediate and long-term educational outcomes in residents completing an internet learning module.

**Methods:** We developed a didactic module on carbon monoxide and methemoglobinemia as part of a toxicology curriculum for emergency department residents. The module consisted of educational content, as well as a multiple-choice pretest, posttest, and 3-month follow-up test. The module content was reviewed by a medical toxicologist who was not associated with this research. The module was developed using established principles of curriculum development, and test questions were developed using established principles of clinical question writing. The pretest, post-test, and 3-month follow-up were formatted in a four-choice best answer format.

**Results:** The average pretest score was 60.20%. The average post-test score was 85.71%. The average 3-month follow-up score was 73.52%. Post-test scores were significantly higher than pretest scores (p<0.001). Three-month follow-up scores were significantly lower than post-test scores (p<0.05). Three-month follow-up scores were significantly higher than pretest scores (p<0.01).

**Conclusion:** In this population, there was improvement in performance from pre- to post-test. Some of this improvement was preserved at 3-month follow-up.

133 Evaluation of the Educational Quality of a First Responder Course for Medical Students

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**Background:** Literature review revealed few descriptions of First Responder content in medical school curricula and no studies evaluating course quality. Columbia University College of Physicians & Surgeons first-year students participated in a 4-hour First Responder course with lectures and eight scenario-based small group sessions. The course goal is for students to achieve basic competence in responding to medical emergencies in non-clinical settings before emergency medical services (EMS) arrives.

**Objectives:** To assess the quality of the First Responder course (effectiveness and efficacy).

**Methods:** Course effectiveness was assessed with both a one-group pre-post test design and a course evaluation questionnaire. The 20-question exam was designed to assess student achievement of course objectives before and after the course. A course evaluation (completed by 97% of students) included 12 Likert-scale questions validated for Columbia medical courses, and two open-ended questions that were coded for frequency of themes.

**Results:** Test: a reliability analysis of the exam was conducted to identify questions too difficult (p-diff < 0.8) to assess competence (one was eliminated). Students responded correctly to 70% of pretest and 91% of post-test questions, a statistically significant difference (paired-samples t-test, p<0.001). Evaluation: students gave very high ratings to all questions (all > 4.0 on scale of 1-5). The highest ratings were for receptivity of faculty (4.36) and lowest were for small group quality (4.11). Common positive themes were quality of instructors (47% of responders), small-group instructional method (43%), lecture quality (20%), and scenario-based learning method (16%). Common negative themes were repetitiveness of scenarios (21%), and inconsistency of teaching between small groups (19%). The course had high efficacy in use of time and materials, but was intensive in faculty time and physical space. Appeal of the course was revealed by comments about enjoyment (11%) and importance of the content (6%), and no comments about lack of appeal.
Conclusion: The course was successful in teaching students how to respond to medical emergencies, with high effectiveness and efficacy. Future courses should continue to emphasize high-quality instructors and small-group design, but should decrease repetitiveness and inconsistency in content.

134 Real-time Assessment of Resident Physician-Patient Communication
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Background: Communication skills and professionalism are two of the ACGME core competencies. The Common Program Requirements for Emergency Medicine state that a program must “provide objective assessments of competence” and “use multiple evaluators” including patients.

Objectives: The objective of this study was to assess the use of a bedside survey completed by patients to evaluate interpersonal and communication skills and professionalism of emergency medicine (EM) residents. An additional survey was given to the EM residents to gauge their improvement. A 10-point scale was used to rate overall professionalism/communication skills. Surveys were administered by student research assistants. Emergency department (ED) patients were non-consecutive patients who completed an IRB-approved 13 item survey shortly after the EM resident’s initial patient evaluation. Additional surveys were collected for ongoing performance improvement. A 10-point scale was used to rate overall professionalism/communication skills. Surveys were administered by student research assistants. Emergency department (ED) patients were excluded if under age 18, non-English-speaking, critically ill, or had altered level of consciousness. Informed consent was obtained during the study period. Survey questions dealt with communication, understanding of patient’s problems, respect, confidence and trust, responsiveness to patient needs, answering questions, and explaining results in an understandable way. Descriptive statistics were used for analysis.

Results: Six hundred and twenty-four resident evaluations were performed over a 4-year period. The overall rating was 9 or 10 on 76% of the surveys, while 3% were ≤ 6. The mean overall rating was 9.13 (SD ± 0.6). Examples of high and low scoring items include: treating patients with respect (95.5%), listening without interrupting (95.1%), answering questions in an understandable way (95%), explaining care or tests in a way the patient could understand (89.7%), and informing the patient that he/she was a resident (60%). Residency leadership has incorporated survey results into scheduled resident feedback and evaluation sessions. Examples of comments used for feedback include: “needs to gain more confidence in herself,” “needs to understand woman problems more, seems embarrassed,” “competent and knowledgeable about questions we asked and thoroughly explained answers to us.”

Conclusion: Immediate bedside rating of residents’ communication and professional skills by patients is a useful tool for evaluating these core competencies and providing constructive resident feedback.

135 Emergency Medical Services Education in Emergency Medicine: A National Survey
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Background: Emergency medical services (EMS) was recently approved as a new subspecialty by the American Board of Medical Specialties, highlighting the core content of knowledge that encompasses prehospital emergency patient care.

Objectives: This study aimed to describe the current state of EMS education at emergency medicine residency programs in the United States.

Methods: An online survey containing multiple choice and free response questions pertaining to resident EMS education was distributed by email invitation to the residency directors of emergency medicine training programs in the United States. The survey was distributed between July 21st, 2010 and September 10th, 2010.

Results: Of 154 programs, 117 (75%) responded to the survey and 108 (70%) completed the survey by answering all required questions. Of completed surveys, 82 programs (76%) reported the cumulative time devoted to EMS didactic education during the course of residency training, a median of 20 hours (range 3–200 hours, interquartile range 12–36 hours). There is a designated EMS rotation in 89% of programs, with a median duration of three weeks (range 1–9 weeks, interquartile range 2–4 weeks). Most programs involve residents on EMS rotations strictly as in field observers (63%), some as in field providers (20%), and the rest with some combination of the two roles. Ground ride-alongs is required in 96% of programs. Direct medical oversight certification is required in 41% of residency programs, but not available in 26% of program jurisdictions. Most residents (69%) provide direct medical oversight initially working in the emergency department, 15% have dedicated medical oversight shifts, and 11% of residents do not provide medical oversight. Disaster preparedness was most frequently listed as the component programs would like to add to the EMS curriculum.

Conclusion: There is a wide range in the didactic, online, and in-field EMS educational experiences provided as part of emergency medicine training. Most residents participate in ground ride-along activities, direct medical oversight, and a dedicated EMS rotation. Ground ride-alongs are most frequently considered the most meaningful component of an EMS rotation. Disaster preparedness is most commonly a desired addition to existing EMS rotations.

136 A Shoulder Dislocation Training Course for Triage Nurses Reduced Emergency Department Door-to-reduction Time
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Background: Patients with a dislocated shoulder should ideally receive immediate x-ray, analgesia, and manipulation and reduction, instead of having to wait until after a medical consultation. A previous study conducted at the same site found that triage nurses trained in the identification of a dislocated shoulder had significantly improved their ability to recognize a shoulder dislocation at triage. We hypothesize that this same training course has reduced emergency department (ED) door-to-reduction time for anterior shoulder dislocations.

Objectives: Determine if the same training course has reduced ED door-to-reduction time for anterior shoulder dislocations.

Methods: All triage nurses attended a 1-hour lecture on the clinical signs of various shoulder injuries and the use of x-ray to confirm their clinical judgement. A pre/post study was conducted over a period of four-months before and after the training sessions. All patients who presented to the ED with an anterior shoulder dislocation were recruited. Patients with open fractures, dislocations that were spontaneously reduced, re-attendances, and those with pre-hospital x-rays already done were excluded. The post reduction x-ray time-stamp was taken as the surrogate time of successful reduction. The door-to-reduction times were analyzed.

Results: Of the 485 patients with shoulder injury in the pre-training group, 115 had anterior shoulder dislocation. In the post-training group, 77 of 540 patients with shoulder injury had anterior shoulder dislocation. Post-training, there was a significant decrease in the door-to-reduction times (69 vs. 61 minutes; p value = 0.021). A decrease in triage-to-reduction times (56 vs. 49 minutes; p value = 0.046) was also evident.

Conclusion: We have demonstrated that a simple shoulder injury training course can significantly improve the door-to-reduction time of patients presenting with anterior shoulder dislocation. This should translate to improved pain management, patient satisfaction, ED length of stay, and turnaround time.
137 Emergency Medicine Directors’ Perceptions on Professionalism: A Council of Emergency Medicine Residency Directors Survey
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Background: The ACGME requires residency training programs to teach and assess professionalism in residents; however, programs may struggle to successfully remediate residents not meeting professionalism standards. To assist programs with this complex issue, a professionalism remediation task force was formed by the Council of Emergency Medicine Residency Directors in Emergency Medicine (CORD-EM), who surveyed program directors (PDs) concerning their experiences.

Objectives: The purpose of this study is to report survey results regarding the identification and rating of unprofessional behaviors and challenges in the evaluation and remediation of professionalism.

Methods: In June 2010, the task force sent an anonymous survey via the CORD listserv to PDs with active EM programs.

Results: Fifty percent (77/154) of eligible PDs responded to the survey. Most PDs rated the unprofessional behaviors of interpersonal/communication conflicts, lack of responsibility during patient care, lack of respect of co-workers, and reports of impairment as “critical”; repeated tardiness, incomplete work, poor ability to accept feedback, poor attitude and repetitive unresponsiveness to aid colleagues as “very serious”; frequent missed deadlines as “serious”; and repetitive failure to complete medical records as “mildly serious.” A relationship between less serious and serious to critical professionalism issues was reported as “often” by 33.8% and “always” by 6.5%. The most common methods of assessment were clinical/advisor evaluations; however, assessment methods were described as inadequate in identifying serious professionalism issues by 50.7% of PDs. Unprofessionalism was most commonly discovered by unofficial faculty complaint (34.5%). Eighty percent report that professionalism is more difficult to remediate than other core competencies. Resident ownership of the problem was reported as most critical to remediation success (84.4%). The greatest challenges in residency remediation perceived by PDs were lack of resident insight or responsibility for the problem (45.2%) and personality/behavioral issues (32.9%).

Conclusion: Identification and remediation of professionalism in EM residents is challenging. A future goal is to create a system by which PDs can use standardized pathways as a guide to identify and remediate unprofessional conduct.

138 Resident Knowledge of Resuscitation Medication Availability
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Christiana Care Health System, Newark, DE

Background: Advanced resuscitation guidelines require knowledge and use of specific medications.

Objectives: This study evaluated residents knowledge of medications immediately available during cardiopulmonary resuscitation in an institutional standardized code cart system. A secondary goal was to improve knowledge through an educational intervention.

Methods: An anonymous survey evaluating knowledge of the institution’s standardized code cart medications and comfort with advanced cardiac life support (ACLS) protocols was validated using cognitive interview methods. The survey was distributed to all PGY-2 and higher emergency medicine (EM), surgery, internal medicine, and combined residents who provide cardiopulmonary resuscitation at this tertiary care teaching hospital. Subsequently an e-learning tool was distributed, followed by a repeat evaluation for knowledge acquisition. Data were analyzed using descriptive statistics and a t-test.

Results: Sixty of 92 eligible residents (65%) completed the initial survey. Eighty-five percent of respondents had used the code cart clinically and 90% were confident in their knowledge of ACLS protocols. Twenty-eight percent were confident in their knowledge of the code cart contents and 18% thought they had received adequate training on the contents of the code cart. The average score for medication content questions was 2.58 of 8 (32%). EM/IM residents’ scores were statistically higher compared to other residents: 3.88 vs. 2.38, p = 0.001. Otherwise there was no difference by program or PGY status. Twenty-five residents completed the follow-up survey. The mean score was 3.92 (49%) compared to 2.58 (32%) initially: p = 0.001.

Conclusion: Residents who lead cardiopulmonary resuscitation are confident in their knowledge of ACLS protocols, but not in their knowledge of immediately available resuscitation medications. Overall performance on questions about the medication content of the institutional standard code cart was poor regardless of level or type of residency training. After a simple educational intervention, resident medication knowledge was improved.

139 The Ultrasound Assessment of Dyspnea: Is a Medical Student With Ultrasound Better Than an Emergency Physician Without Ultrasound?
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Background: The use of ultrasound by medical students has recently expanded.

Objectives: This study compared the diagnostic accuracy of a third-year medical student using a focused chest ultrasound examination against the diagnostic accuracy of an attending emergency physician using only history and physical examination in patients with dyspnea.

Methods: This study was a prospective observational study at an urban teaching emergency department with an annual census of greater than 100,000 visits per year. Enrollment occurred on a convenience basis, between the hours of 9am - 6pm. Prior to enrollment, one third-year medical student received goal-directed training in point of care ultrasound. When patients presented to the emergency department with a chief complaint of dyspnea, an attending physician saw and evaluated the patient and postulated the most likely diagnosis. The physician only used the history and physical exam, and did not use ultrasound or other imaging to formulate the diagnosis. Subsequently, the medical student performed a focused chest ultrasound exam on the patient, evaluating the heart, inferior vena cava, lungs, and pleura. The student interpreted the study and formed a final diagnosis. The ultrasound director retrospectively reviewed all the ultrasound examinations performed during the study. The medical student’s final diagnosis and the emergency physician’s final diagnosis were compared to the gold standard diagnosis: the discharge diagnosis from the hospital.

Results: Thirty-three patients were enrolled in the study. Compared to the discharge diagnosis, the third-year medical student correctly diagnosed 70% of patients (23/33) while the attending emergency physician correctly diagnosed 61% patients (20/33) (p = 0.2192).

Conclusion: The medical student’s diagnostic accuracy with ultrasound was no different than the attending emergency physician’s diagnostic accuracy without ultrasound.
140 Inter-rater Reliability Assessment of the Best Evidence in Emergency Medicine Rater Scale, a Medical Literature Rating Tool for Emergency Physicians

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Background: The Institute of Medicine, the American Board of Medical Specialties, and the American Board of Emergency Medicine have mandated a continuing medical education process-improvement plan by which physicians can maintain clinical practice that is contemporaneous with current research findings. The challenge faced by emergency medicine (EM) physicians trying to stay current is, in part, due to the wide scope of EM practice, so reliable methods to identify clinically-relevant research are desperately needed.

Objectives: Our primary objective was to measure the inter-rater reliability of a novel scale for EM physicians to rate the clinical relevance of multiple recently published studies based only on the title and conclusions of each manuscript. Second, we sought to determine the minimum number of raters needed to achieve acceptable reliability and also compare the scale’s performance with an established general literature rating scale in an EM physician population.

Methods: We electronically distributed the title, conclusion, and a PUBMED link for 23 recently published studies related to EM to a volunteer group of EM physicians. The volunteers answered two demographic questions and rated the articles using one of two randomly assigned seven-point, Likert scales, the BEEM (Best Evidence in Emergency Medicine) rater scale (n = 68) or the MORE (McMaster Online Rating of Evidence) scale (n = 66) over two separate administrations. We measured the inter-rater reliability of each scale using generalizability theory.

Results: The inter-rater reliability of the BEEM Rater Scale ranged between 0.90 - 0.92 across administrations (95% CIs: 0.86–0.93, 0.89–0.94, respectively). D-study showed a minimum of 12 raters is required for acceptable reliability of the BEEM scale. The inter-rater reliability of the MORE scale was 0.82 to 0.84.

Conclusion: The BEEM Rater Scale is a highly reliable, single-question tool for a small number of EM physicians to collectively rate the clinical relevance of recently published studies to the specialty of EM, using just the title and conclusions and is comparable to the two-question MORE rating system.

### BEEM Rater Scale

<table>
<thead>
<tr>
<th>1</th>
<th>Useless information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Not really interesting, not really new, changes nothing</td>
</tr>
<tr>
<td>3</td>
<td>Interesting and new but doesn't change practice</td>
</tr>
<tr>
<td>4</td>
<td>Interesting and new, has the potential to change practice</td>
</tr>
<tr>
<td>5</td>
<td>New and important: this would probably change practice for some Emergency Physicians</td>
</tr>
<tr>
<td>6</td>
<td>New and important: this would change practice for most Emergency Physicians</td>
</tr>
<tr>
<td>7</td>
<td>This is a “must know” for Emergency Physicians</td>
</tr>
</tbody>
</table>

141 Medical Student Professionalism Narratives: A Thematic Analysis and Interdisciplinary Comparative Investigation

Matthew Malone, Aaron W Bernard, Nicholas Kman, Jeffrey Caterino, and Sorabh Khandelwal

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Background: Professionalism development is influenced by the informal and hidden curriculum.

Objectives: The primary objective of this study was to better understand this experiential learning in the setting of the emergency department (ED). Secondly, the study aimed to explore differences in the informal curriculum between emergency medicine (EM) and internal medicine (IM) clerkships.

Methods: A thematic analysis was conducted on 377 professionalism narratives from medical students completing a required EM clerkship from July 2008 through May 2010. The narratives were analyzed using established thematic categories from prior research as well as basic descriptive characteristics. Chi-square analysis was used to compare the frequency of thematic categories to prior research in EM. Finally, emergent themes not fully appreciated in the established thematic categories were created using grounded theory.

Results: Observations involving interactions between attending physician and patient were most abundant. The narratives were coded as positive 198 times, negative 128 times, and hybrid 37 times. The two most abundant narrative themes involved manifesting respect (36.9%) and spending time (23.7%). Both of these themes were statistically more likely to be noted by students on EM clerkships compared to IM clerkships. Finally, analysis revealed emergent themes specific to EM clerkships: appropriate use of the emergency department, pain management/drug seeking behavior, negative attitudes towards patients (cynicism/preconceived notions).

Conclusion: This analysis describes an informal curriculum that is diverse in themes. Student narratives suggest their clinical experiences to be influential on professionalism development. Medical students focus on different aspects of professionalism depending on clerkship specialty.

142 Observing the Impact and Retention of an Electrocardiogram Interpretation Module on First Year Emergency Medicine Residents

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Background: Electrocardiogram (ECG) interpretation is one of the most vital skills possessed by an emergency medicine (EM) physician. ECG interpretation has traditionally been taught in medical school and reinforced through clinical practice.

Objectives: To observe the impact of a three part educational module on ECG interpretation for a group of first year EM residents over the course of four months.

Methods: A prospective analytic cohort study was conducted to examine selected data based on examinations taken by 17 first year EM residents. The current education module consists of a three part lecture series over the course of one month. Each lecture covered essential components of ECG interpretation. Three examinations were given; the first was given prior to the first lecture, the second upon completion of the teaching module, and the third approximately four months later. The test consisted of 42 free response questions. All ECGs were obtained from a common well-established emergency ECG text. Scores from each test were compared using the paired t-test. A p-value ≤ 0.05 was considered significant.

Results: There was a statistically significant improvement in questions answered correctly between the first and second examination (47.29% ± 10.73 vs 65.06% ± 13.07, p = 0.001). There was also a statistically significant improvement between the first examination and the third examination (47.29% ± 10.75 vs 58.82% ± 13.62, p = 0.013). There was not a statistically significant difference between the second examination and the third (p = 0.093).

Conclusion: The data suggest that our education module effectively improved the knowledge of EM residents regarding ECG.
143 What Does “Service Obligation” or “Clinical Education” Mean?
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Background: The ACGME resident survey is designed to monitor for potential non-compliance with accreditation standards. The question, “How often has your clinical education been compromised by excessive service obligations?” is included. Neither “service obligation” nor “clinical education” are defined in the survey, resulting in confusion for all.

Objectives: To determine if there is a discrepancy between faculty and resident assessment of clinical education and service obligations.

Methods: An online survey was deployed to all residents and faculty at a large, urban emergency medicine residency program. Responses were expressed as a five-point Likert scale.

Results: A total of 32 residents (58% response rate) and 19 attendings (46% response rate) completed the survey. There was a large degree of agreement on what patient care activities were considered clinical education vs. service obligation; for example, most residents and attendings felt placing an IV or transporting a patient to radiology was a service obligation, while intubation, interpretation of an EKG, and talking to family was clinical education (all CI overlapping for attendings and residents). Major variances appeared between attending/resident assessment on discussing patients with consultants (CI for residents 4.4–4.5, CI for attending 4.5–5) and writing discharge instructions (CI for residents 2.7–3.5 for attendings 3.8–4.5). In addition, the change in the scenario of the waiting room being full only shifted responses slightly to make all involvement more clinical education (0.1 point change, CI overlapping for attending and residents). The largest difference occurred in a scenario where an attending had already seen a patient and asked the resident to also see this patient while half the resident staff was out; the component evaluated was performing the physical exam, which revealed a substantial variance in attending/resident definitions of service obligation/clinical education (resident CI 3.1–3.9, attending 4.1–4.9).

Conclusion: There is good consensus between residents and attendings on what constitutes a service obligation and clinical education. Variance does exist on discharge instructions and discussing patients with consultants. Waiting room pressures do not substantially affect resident or attending assessment of service obligation vs clinical education, but absence of residents due to illness does.

144 A Mixed-methods Study of Quality of Care Provided to Patients Boarding in the Emergency Department: Comparing Emergency Department and Inpatient Responsibility Models
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Background: Despite increased boarding of inpatients in the emergency department (ED), few studies have examined how hospitals manage boarded patients. Hospitals frequently use one of two primary organizational models; we define these as the “Emergency Department Responsibility” (EDR) model and the “Inpatient Responsibility” (IPR) model.

Objectives: To compare care for boarded patients under an EDR versus an IPR model.

Methods: We compared the EDR and IPR models using mixed-methods. We analyzed secondary data from a retrospective cohort of ED patients admitted to two academic hospitals in 2004–2005 with chest pain, pneumonia, and cellulitis. We hypothesized that EDR patients had more delays in cardiac enzyme checks, prothrombin time tests (PTT), and antibiotic administration while boarding than IPR patients. Trained chart abstractors blinded to the study hypothesis abstracted explicit information from ED charts. We performed Wilcoxon and chi-square analyses of differences in patient characteristics. We then calculated chi-square differences in delay rates and used logistic regression to compare differences in outcomes. We subsequently collected qualitative data through interviews of ED caregivers to explore reasons for our quantitative outcomes. Inter-rater reliability was measured through re-abstraction of 4% of randomly selected charts (κ = 0.84) and comparison of code assignment (κ = 0.62).

Results: We reviewed 1,431 charts: 829 EDR patients and 602 IPR patients. We conducted 10 caregiver interviews. EDR patients had a lower rate (0.056 vs. 0.149 events/ hour, p < 0.0001) and lower odds (OR 0.35, 95% CI 0.13–0.95) of home medication delays while boarding than IPR patients. Similarly, EDR patients had a lower rate (0.003 vs. 0.015 events/ hour, p = 0.01) and lower odds (OR 0.22, 95% CI 0.06–0.79) of cardiac enzyme delays than IPR patients. There were no differences in patient characteristics, PTT tests, antibiotic administration, or adverse events. Interviews revealed that culture, resource prioritization, and systems issues made care for boarded patients challenging for caregivers.

Conclusion: We failed to demonstrate the IPR model’s superiority, suggesting that a theoretically better responsibility model may not deliver better care to boarded patients due to cultural, resource prioritization, and other systems issues.

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Background: Most emergency departments (EDs) are neither equipped nor staffed to adequately provide prolonged care for critically ill patients. Resources devoted to the care of critically ill patients may detract from the care given to other patients and contribute to ED crowding.

Objectives: We sought to quantify trends in the hours of care provided to critically ill patients in U.S. EDs.

Methods: We conducted a cross-sectional analysis of a nationally representative sample of 287,803 ED visits from the National Hospital Ambulatory Medical Care Survey (NHAMCS) for the years 2001–2008 that included 4,056 visits resulting in admission to a critical care unit. A patient was considered critically ill if his or her ED visit resulted in admission to a critical care unit. Data from the National ED Inventory-USA were used to identify the annual number of operational EDs in the U.S. and to estimate the effect of national trends at the level of an individual ED. Visit rates were calculated using US Census estimates.

Results: From 2001 to 2008, the annual volume of hours of care provided to critically ill patients in U.S. EDs more than tripled,
Computed tomography use in the ED has grown significantly in recent years across a broad range of patients and presenting complaints. Its increasing utilization does not appear to be influencing decisions to hospitalize pediatric patients.

Conclusion: Computed tomography use in the ED has grown significantly in recent years across a broad range of patients and presenting complaints. Its increasing utilization may be influencing decisions to hospitalize patients. Additional research is needed to better assess its effect on outcomes in the ED and to optimize its use in this setting.

147 National Trends in Use of Computed Tomography on the Pediatric Population in the Emergency Department
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Background: Pediatric patients are especially vulnerable to the effects of ionizing radiation from computed tomography (CT). The role of CT in acute illnesses has grown; however, little is known about how CT use on the pediatric population in the emergency department (ED) has changed over time.

Objectives: To characterize national trends and practice patterns in CT utilization on pediatric patients in the ED.

Methods: A retrospective study was performed using the 1997 to 2008 National Hospital Ambulatory Medical Care Survey (NHAMCS), a large nationwide survey of ED services. Pediatric patients were defined as ≤ 21 years of age. Given the fewer pediatric cases of CT use found in this database, 3 year blocks were grouped together for the purposes of analysis. We assessed 1) CT use during an ED visit, stratified by patient demographics and presenting complaints, and 2) hospital admission or transfer to another facility by CT use.

Results: Of 416 million pediatric ED visits included during the study period, 17.8 million (4.3%) involved patients receiving a CT. Overall, CT use during ED visits increased from 1.6% (95% confidence interval [CI] 1.1% - 2.0%) in 1997 to 5.9% (95% CI 4.9% - 6.9%) in 2008. Rates of CT use grew most dramatically in older pediatric patients. Among the 20 most common presenting complaints to the ED for pediatric patients, there was a universal increase in CT use. CT use was particularly high and, by the period 2006–2008, exceeded 10% in patients with: 1) headache, 2) convulsions, 3) vertigo, dizziness, or syncope, 4) abdominal pain, and 5) neck or back symptoms. Rates of growth of CT use were highest for the following presenting complaints: psychological symptoms (adjusted risk ratio [RR] comparing 2006–2008 to 1997–1999, 9.1; 95% CI 1.4 - 20.5); eye symptoms (adjusted RR 8.3, 95% CI 3.0 - 16.0); cough, upper respiratory or ears/nose/throat symptoms (adjusted RR 7.3, 95% CI 1.2 - 18.8); chest pain (adjusted RR 7.1, 95% CI 1.2 - 18.4); and, abdominal pain (adjusted RR 7.0, 95% CI 3.1 - 13.1). In multivariable modeling, rises in CT use were not associated with lower rates of hospitalization or transfer over time in this population (P = 0.34).

Conclusion: Computed tomography use in the ED has grown significantly in recent years across a broad range of pediatric patients and presenting complaints. Its increasing utilization does not appear to be influencing decisions to hospitalize pediatric patients.

148 Broken Teeth, Broken Promises
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Background: State Medicaid programs must provide access to dental care that is equivalent to access afforded by private insurance in the same geographic area. A broken front tooth, with ongoing pain, warrants an urgent emergency department (ED) referral to a dentist within 24–48 hours to avoid infection and loss of the tooth.

Objectives: We examined access to urgent dental care for children living in a large urban county in which the Medicaid program’s dental benefits are administered by a national dental benefits management company to recruit providers and streamline billing processes.

Methods: Trained telephone interviewers posed as the mother of a 10-year-old boy seen the night before in the ED with an Ellis class III fracture and referred for urgent dental follow-up. Callers contacted a stratified random sample of 671 Cook County, Illinois dental practices enrolled in the Medicaid program between February–May 2010. Stratification was based on location within or outside of Chicago. A “dental practice” was defined as a unique...
Background: On January 1, 2009, the Massachusetts Department of Public Health (DPH) banned the practice of ambulance diversion in the state. One predicted consequence was increased emergency department (ED) crowding. Another problem was that ED crowding would lead to increased turnaround time (TAT) for emergency medical services (EMS) personnel, delaying their return to service.

Objectives: To determine if there was a change in ED volume, length of stay (LOS), or ambulance TAT following a statewide ban on ambulance diversion.

Methods: This is a retrospective, observational study involving nine Boston-area EDs and Boston EMS (the provider of 9-1-1 service to the City of Boston). ED volume, monthly median ED LOS for admitted and discharged patients, number of Boston EMS runs to each hospital, and monthly mean ambulance TAT were collected for 2008 and 2009. The number of diversion hours for each institution in 2008 was obtained from the Massachusetts DPH. We performed multivariate linear regression on LOS and TAT adjusted for hospital volume and hospital fixed effects to determine the effect of the ban on the outcome. We ran a univariate linear regression stratified by hospital on the outcome to determine unadjusted change in hospital volume after the ban.

Results: Multivariate regression controlling for hospital fixed effects and hospital volume demonstrated an overall 13.9 minute decrease (p<0.001) in median LOS for admitted patients (95% CI 7.2, 20.6), a 7.46 minute decrease (p<0.001) in median LOS for discharged patients (95% CI 4.5, 10.4), and a 2.24 minute decrease in mean ambulance TAT (95% CI 1.3, 3.2). In the stratified univariate analysis on hospital volume, five hospitals demonstrated a statistically significant increase in ED volume, while the remainder experienced no change. Five EDs experienced a significant decrease in LOS for either admitted or discharged patients or both (p<0.05). No hospitals in our study experienced an increase in ED LOS for either admitted or discharged patients. Ambulance TAT decreased for all but one hospital (p<0.05).

Conclusion: Banning ambulance diversion may reduce the harms associated with diversion without causing a significant increase in ED LOS or ambulance TAT. Study of other outcomes and geographic regions is necessary to further characterize the effects of this policy.

149 The End of Ambulance Diversion: Changes in Emergency Department Length of Stay and Ambulance Turnaround Time

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1Beth Israel Deaconess Medical Center, Boston, MA; 2Boston Medical Center, Boston, MA; 3Massachusetts General Hospital, Boston, MA; 4Boston EMS, Boston, MA; 5Tufts Medical Center, Boston, MA; 6Mount Auburn Hospital, Cambridge, MA; 7Brigham and Women’s Hospital, Boston, MA; 8St. Elizabeth’s Medical Center, Boston, MA; 9Cambridge Health Alliance, Cambridge, MA

Background: Callers completed 82 paired calls to 41 randomly-selected dental practices enrolled in the Medicaid dental program (61% within Chicago and 39% outside of Chicago). If an appointment was provided, it was usually (71%) within two days. However, only 68% of children with Medicaid/CHIP obtained an appointment compared to 100% of privately-insured children with the same urgent injury. Dental practices enrolled in the Medicaid/CHIP program were 18.2 times as likely to deny an appointment to a child covered by Medicaid/CHIP compared to a privately-insured child (P<.001).

Conclusion: We found disparities in Medicaid-enrolled dentists’ acceptance of Medicaid/CHIP versus private coverage for children needing emergency treatment. Results can inform the development of policy interventions aimed at improving access to oral health care.
151 Does Keeping Acute Ischemic Stroke Patients in the Emergency Department Longer Change Their Outcome? 

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1University of Rochester Medical Center; Rochester, NY; 2University of Florida College of Medicine, Gainesville, FL

Background: Length of stay in the emergency department (ED LOS) is thought to affect outcome of critical patients.

Objectives: To study the effect of ED LOS on functional outcome in ischemic stroke patients.

Methods: This is a sub-analysis of a prospective cohort of 149 acute ischemic stroke patients presenting to the hospital from 06/2009 - 02/2010. Demographics, ED LOS, stroke severity (NIH Stroke Scale [NIHSS] on arrival), and functional outcome (modified Rankin score at discharge - mRS) were collected for each patient. The ED LOS was documented from time of registration to time of actual disposition from the ED. ED LOS was dichotomized at the average (cases). Matching on age and NIHSS gave us 45 controls (ED LOS > average LOS) for 29 cases. The median mRS for these patients was 2.5 (IQR 1-5), and 50% of this subcohort had a functional outcome at discharge between the cases and the controls. We then created a subset of patients with similar NIHSS and age. There is often a large emphasis that is placed on moving patients out of the ED quicker because of the conception that critical care in the ED is often inadequate, and this may adversely affect outcome of patients with acute illnesses. This does not seem to be true for patients with stroke.

Results: A total of 149 stroke patients were included in the cohort. For these patients, the mean ED LOS was 497 min (SD 526.7 min, median 319 min). A total of 25.3% of patients in our study cohort actually had lengths of stay equal to or lower than this average (cases). Matching on age and NIHSS gave us 45 controls (ED LOS > average LOS) for 29 cases. The median mRS for these patients was 2.5 (IQR 1-5), and 50% of this subcohort had a functional outcome (mRS2). There was no difference with respect to the time since onset of symptoms for the cases and controls (median 145 min v/s 147 min; p = 0.395). Thus by matching for age and NIHSS we created a cohort that was similar with respect to stroke severity, co-morbidities, and potential for time-sensitive treatment. There was no difference with respect to functional outcome at discharge between the cases and the controls (median mRS 2 v/s 3; p = 0.33).

Conclusion: Length of stay in the ED has no bearing on the outcome of patients with similar NIHSS and age. There is often a large emphasis that is placed on moving patients out of the ED quicker because of the conception that critical care in the ED is often inadequate, and this may adversely affect outcome of patients with acute illnesses. This does not seem to be true for patients with stroke.

152 Utilization of Health Maintenance Services Among County Emergency Department Patients With Diabetes

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Background: The long-term complications of diabetes can be mitigated via regular health maintenance services. The American Diabetes Association (ADA) recommends that these services be repeated annually, but overcrowded clinics combined with personal, financial, cultural, and logistical barriers make this difficult in our strapped county health care system. We believe we can identify patients most in need of health maintenance services in the emergency department (ED).

Objectives: To characterize the frequency of health maintenance services received by ED patients with diabetes and describe the association between having a primary care physician (PCP) and glycemic control.

Methods: This was a prospective study of consecutive patients with a known history of diabetes seen in a Los Angeles county ED. Patients who were critically ill or unable to provide written informed consent were ineligible. Research assistants used our electronic tracking system to identify all patients present in the ED with diabetes at two specified times daily. Patients had an HbA1C measurement, provided basic demographic information, and were asked if they had a PCP. Subjects then indicated when they had their last ophthalmologic exam, foot exam, dental exam, blood pressure check, cholesterol check, and HbA1C measurement.

Results: Of 219 total enrolled patients, basic demographic information was as follows: mean age 52.0 years (SD 12.0), 87.1% Hispanic, 54.9% Spanish-speaking, 52.2% female, mean SBP 121 (SD 21.9), mean DBP 78 (SD 17.4), and mean BMI 30.8 (SD 7.0). Only eight patients (3.6%) reported receiving all assessed health maintenance services as recommended by the ADA (description of full sample in table). 69.7% had a PCP. Having a PCP was associated with significantly lower HbA1C (median 9.5% vs 7.6%, p<0.01).

Conclusion: Only 3.6% of ED patients had all basic health maintenance services in the timeframes recommended by the ADA. Shockingly, large percentages of patients stated they had never received some of these basic services. Patients who reported having a PCP had significantly lower HbA1C levels. Our findings indicate that county ED patients are in need of an effective link with appropriate health maintenance services.

153 Patient Characteristics Associated With Preventable Admissions Through the Emergency Department

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Background: Ambulatory care sensitive conditions (ACSCs) are defined by the Agency for Healthcare Research and Quality (AHRQ) as hospitalizations for conditions that may be prevented with timely and effective primary care. Emergency department (ED) volumes have increased sharply over the past two decades,
yet there is little information on patient-level characteristics associated with ED admission for primary care preventable conditions. **Objectives:** The purpose of this study was to define patient level characteristics of ED admissions for AHRQ-defined ACSCs.  

**Methods:** Administrative data for all adult ED admissions between January 1, 2006, and August 1, 2010 were processed using AHRQ’s Quality Indicator Windows Application Version 4.1a and SAS to flag ACSC diagnostic codes. Logistic regression analysis was performed using SPSS to determine patient characteristics predictive of an ACSC admission. Statistical significance was tested with Wald chi-square, and p < 0.05 was considered significant.

**Results:** 61,711 ED encounters by 40,974 unique patients were analyzed. 9.6% of total hospitalizations (5966) were related to an AHRQ defined ACSC. 4,370 unique patients were admitted one or more times through the ED for an ACSC. Patient characteristics predictive of a primary care preventable admission included older age (p<0.0001), African-American race (p<0.0001), and having a public or government payer source (p<0.0001). Patients with ACSC related admissions spent fewer days in the hospital and in ICUs (p<0.0001, p=0.0103), but had higher acuity on ED presentation than patients with non-ACSC admissions (p value<0.03).

**Conclusion:** Age, race, and payer status are significant predictors of potentially avoidable admissions for patients presenting with higher acuity levels to the ED. Identification of target populations with inadequate access to timely and effective primary care may offer insight into strategies to ease ED crowding and improve patient outcomes.

### 154 Hospital Volume and Survival in Out-of-hospital Cardiac Arrest

**Objectives:** Cardiac arrest centers may improve outcomes by achieving sufficient experience in post-arrest care. We analyzed the relationship between survival and hospital volume among patients suffering out-of-hospital cardiac arrest (OHCA).

**Methods:** Cohort analysis of prospectively collected, Ustein-compliant data from the Cardiac Arrest Registry to Enhance Survival (CARES) from 10/05-12/09. Included were those with OHCA of presumed cardiac etiology and transported to a hospital. The primary outcome was survival to discharge. Hospital characteristics were obtained via the 2005 American Hospital Association Annual Survey. A hospital’s use of therapeutic hypothermia (TH) was obtained via direct survey (e-mail/phone) to determine TH capability. To adjust for the clustered nature of the data, a multilevel, hierarchical logistic regression was performed controlling for patient and hospital confounders. Hospital volume was modeled as a categorical variable (OHCA/year <=10, 11–39, >=40) and as a continuous variable. Stratified analyses evaluating those with sustained ROSC and those who survived to hospital discharge were also performed.

**Results:** The cohort included 9,314 patients from 184 hospitals in 17 states. OHCA outcomes were more often witnessed, occurred in private residence, and presented with a non-shockable rhythm. Survival was 16% overall and 34% among those admitted to the hospital. Among those admitted, individual hospital survival varied widely (0–100%). Survival differed between the three hospital groups (16% for <=10 vs. 18% for 11–39 vs. 14% for >=40; p<0.001). After multilevel adjustment, there was no evidence of difference in survival across the groups. Compared to patients cared for at hospitals with <=10 arrests/year, the adjusted OR of survival was 1.10 (CI95 0.84–1.43) among 11–39 annual volume, and 1.14 (CI95 0.87–1.49) among >=40 volume. When volume was modeled continuously, no significant relationship was identified between hospital volume and survival (OR 1.00; CI95 0.99–1.00).

**Conclusion:** Hospital OHCA volume was not associated with the likelihood of survival. Additional efforts are required to determine what hospital characteristics might account for the variability observed in OHCA hospital outcomes.

### 155 Impact of Preliminary Radiology Interpretation on Malpractice Expense

**Objectives:** To assess the malpractice costs associated with the process of preliminary radiology interpretations.

**Methods:** Retrospective review of malpractice claims and suits in CRICO/RMF’s (malpractice insurer for the Harvard Medical Institutions) Comparative Benchmarking System, which contains 120,000 claims/suits from a group of 400 participating hospitals. The data base was queried for cases that identified radiology as the responsible discipline in cases with a diagnosis-related allegation during the 5 year time frame from 2004 to 2009 and narrowed to include only four categories deemed most likely to contain cases of potential interest: 1) turnaround time for results too long, 2) failure/relay in reporting findings/revised findings, 3) lack of/failure in patient follow up system - new finding, 4) clinician did not receive results. The de-identified case narratives from this search were reviewed by two of the study authors to determine if change from preliminary to final reading was a principle or sole contributor to adverse outcome.

**Results:** Three hundred and twenty-three cases were attributed to radiology, with a cost of $95 million. Twenty-one came from the categories of interest. Seven of the 21 cases were deemed related to the process of preliminary reading. Two cases were associated with patient death and one with major permanent disability. The total malpractice expense from these seven cases was $7.1 million.

**Conclusion:** The practice of preliminary reading of radiologic studies is associated with significant avoidable malpractice expense and contributes to preventable patient harm. The expense of providing final expert interpretation at the time of medical decision-making in the study population is unknown. Avoidance of unnecessary litigation expense and patient injury can be viewed as return on investment against this cost.

### 156 Hospital Characteristics Associated With Therapeutic Hypothermia

**Objectives:** We sought to determine which hospital characteristics are associated with the use of TH in hospitals that care for SCA patients.

**Background:** Therapeutic hypothermia (TH) improves clinical outcomes after sudden cardiac arrest (SCA). The use of TH has been suggested as one criterion for Cardiac Arrest Resuscitation Centers.

**Methods:** Retrospective review of malpractice claims and suits in CRICO/RMF’s (malpractice insurer for the Harvard Medical Institutions) Comparative Benchmarking System, which contains 120,000 claims/suits from a group of 400 participating hospitals. The data base was queried for cases that identified radiology as the responsible discipline in cases with a diagnosis-related allegation during the 5 year time frame from 2004 to 2009 and narrowed to include only four categories deemed most likely to contain cases of potential interest: 1) turnaround time for results too long, 2) failure/relay in reporting findings/revised findings, 3) lack of/failure in patient follow up system - new finding, 4) clinician did not receive results. The de-identified case narratives from this search were reviewed by two of the study authors to determine if change from preliminary to final reading was a principle or sole contributor to adverse outcome.

**Results:** Three hundred and twenty-three cases were attributed to radiology, with a cost of $95 million. Twenty-one came from the categories of interest. Seven of the 21 cases were deemed related to the process of preliminary reading. Two cases were associated with patient death and one with major permanent disability. The total malpractice expense from these seven cases was $7.1 million.

**Conclusion:** The practice of preliminary reading of radiologic studies is associated with significant avoidable malpractice expense and contributes to preventable patient harm. The expense of providing final expert interpretation at the time of medical decision-making in the study population is unknown. Avoidance of unnecessary litigation expense and patient injury can be viewed as return on investment against this cost.
Methods: Patient data entered in the Cardiac Arrest Registry to Enhance Survival (CARES) registry from 2005 through 2009 from 21 states were reviewed. Hospital characteristics were obtained from the 2005 American Hospital Association’s Annual Survey of Hospitals. During the summer of 2010, CARES representatives at each hospital were contacted via e-mail and/or telephone to determine hospitals’ current availability of TH. Hospital characteristics with and without TH were compared using chi-square and Wilcoxon rank sum statistics. Patient level characteristics were also compared in TH hospitals vs non-TH hospitals using descriptive statistics.

Results: Emergency medical services (EMS) transported 15,849 patients to 239 hospitals. Four hospitals did not respond to contact efforts, leaving 235 hospitals for analysis. Sixty-seven percent of hospitals provided TH. TH hospitals were more likely to be teaching hospitals (33% vs. 13%, p<0.05), trauma centers (42% vs. 23%, p<0.05), non-profit centers (82% vs. 71%, p<0.05) with a higher number of annual admission (22,165 vs. 12,986, p<0.001). TH hospitals were more likely to provide cardiac catheterization than non-TH hospitals (87% vs. 67%, p<0.05). Patients cared for in hospitals offering TH were more likely to have presented in ventricular fibrillation or ventricular tachycardia (30% vs. 22%, p<0.05), arrest in a public place (35% vs. 30%, p<0.05), have a pulse restored (45% vs. 32%, p<0.05), and survive to hospital discharge (13% vs. 7%, p<0.05).

Conclusion: Larger, non-profit, teaching hospitals with a cardiac catheterization lab were more likely to provide TH than smaller, for-profit community hospitals. These TH hospitals are also more likely to receive patients who can benefit from TH.

### 157 Hospital Characteristics Impacting HCAHPS Performance Scores and the Implications for Hospital Reimbursement

**Timothy Bullard**, Jay Falk, Pam Nickolenko, Jodie Cunningham, Linda Papa
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#### Background:
Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) was designed by the Centers for Medicare and Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ) in order to provide a standardized instrument for collecting and measuring patients’ perceptions of their hospital experience. It is the intent of CMS to use these ratings to hospital reimbursement.

#### Objectives:
This study assessed hospital characteristics not previously adjusted for in the HCAHPS analysis that could potentially bias hospital performance scores and affect hospital reimbursement. The effect of these hospital characteristics were then examined using HCAHPS survey measures.

#### Methods:
This cross-sectional study assessed data from the CMS Hospital Compare CMS Database for 2008 combining the scoring data with demographic and financial data from the American Hospital Association (AHA). Hospital characteristics and responses to survey measures were compared between hospitals in the top 10% in their “overall” global rating score versus hospitals that were not in the top 10% in their “overall” rating score. Data were analyzed using adjusted OR (95% CI).

#### Results:
There were 3739 hospitals identified in the database and 3717 had complete data for analysis. Of these 3717, 370 hospitals were in the 90th percentile (top 10%) for “overall” rating. Hospital characteristics that had the strongest association with being in the top 10% were 1) number of beds (OR = 0.996 [0.994–0.998]); 2) critical access hospital (OR = 2.129 [1.482–3.058]); 3) having an emergency department (OR = 0.455 [0.213–0.973]); 4) being a specialty hospital (OR = 14.1 [6.83–29.18]); and 5) survey response rate (OR = 1.089 [1.072–1.107]). These hospital characteristics also influenced how survey measures ranked and which had the strongest association with being in the top 10%.

#### Conclusion:
This analysis identified hospital factors that have not previously been adjusted for in the HCAHPS analysis by CMS when rating overall performance of hospitals. Lower bed status, being a critical access hospital, being a specialty hospital, having no emergency department, and having a higher survey response rate were significantly associated with hospitals being in the 90th percentile (top 10%) for the “overall” category of HCAHPS. This could pose an important bias that could influence future reimbursement.

### 158 Do Health Beliefs Influence the Likelihood of Patient Compliance in Prospective, Longitudinal Studies? Insight From a Randomized Trial of Hypertension Management

**Timothy Muchayi, Phillip D Levy, Aaron Brody, James Mahn, Alexander Marinica, Justin Carroll, Samar Nasser, Lowell Hedquist, Shiling Zhang, and John M. Flack**
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#### Background:
Despite increased awareness of hypertension (HTN), African Americans have poorer blood pressure (BP) control than their racial and ethnic counterparts. This is due in part to issues of compliance and medical follow-up, which in turn, may be related to underlying health beliefs. Understanding such beliefs may offer the opportunity to enhance compliance by permitting delivery of a tailored message.

#### Methods:
This study assessed hospital characteristics not previously adjusted for in the HCAHPS analysis that could potentially bias hospital performance scores and affect hospital reimbursement. The effect of these hospital characteristics were then examined using HCAHPS survey measures.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Drop-Out n=29 Mean (SD)</th>
<th>On-Treatment n=91 Mean (SD)</th>
<th>P value</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge: How much do you know about high blood pressure related heart disease?</td>
<td>5.0 (3.1)</td>
<td>5.7 (3.0)</td>
<td>0.26</td>
<td>1 - not at all, 10 - a lot</td>
</tr>
<tr>
<td>Perceived susceptibility: How likely are you to develop a failing heart some time in your life?</td>
<td>2.2 (1.2)</td>
<td>2.0 (0.9)</td>
<td>0.23</td>
<td>1 - not at all, 2 - somewhat, 3 - very, 4 - almost Certain</td>
</tr>
<tr>
<td>Perceived severity: How likely are you to die at a younger age if you develop a failing heart?</td>
<td>2.1 (1.1)</td>
<td>3.0 (1.1)</td>
<td>0.48</td>
<td>1 - not at all, 2 - somewhat, 3 - very, 4 - almost certain</td>
</tr>
<tr>
<td>Perceived barriers: I do not have a doctor to help me treat my high blood pressure because I have no insurance</td>
<td>1.7 (1.0)</td>
<td>1.8 (1.0)</td>
<td>0.76</td>
<td>1 - strongly agree, 2 - agree, 3 - disagree, 4 - strongly disagree</td>
</tr>
<tr>
<td>Cues to action: I know family and or friends who had high blood pressure and developed a failing heart</td>
<td>2.0 (1.0)</td>
<td>2.3 (1.0)</td>
<td>0.11</td>
<td>1 - strongly agree, 2 - agree, 3 - disagree, 4 - strongly disagree</td>
</tr>
<tr>
<td>Self efficacy: How confident are you that you will be able to follow-up with a doctor on a regular basis?</td>
<td>9.2 (1.3)</td>
<td>8.5 (2.3)</td>
<td>0.15</td>
<td>1 - not at all, 10 - a lot</td>
</tr>
</tbody>
</table>
**Objectives:** To gain insight into non-compliance by comparing health beliefs of on-treatment and drop-out patients enrolled in a clinical trial of BP management.

**Methods:** This is a substudy of a prospective, randomized clinical trial designed to evaluate optimal BP targets in a high-risk cohort of asymptomatic patients with subclinical target-organ cardiac damage recruited from an urban emergency department (ED). A 24-item survey based on constructs from the Health Belief Model (HBM) was administered to study participants. The HBM is a validated psychosocial instrument designed to ascertain patient perceptions of chronic disease. For purposes of this study, the HBM was focused on perceived risk for cardiac complications caused by HTN. As part of the study protocol, subjects were required to return every three months for reassessment in an HTN clinic and reissuance of antihypertensive prescriptions (all of which were paid for by the study). In this substudy, HBM data for patients who remained on-treatment are compared with data for those who dropped-out.

**Results:** One hundred and forty-nine patients were enrolled and 123 were successfully randomized (65 [52.8%] to control and 58 [47.2%] to treatment). Over the follow-up period, 29 patients (23.5%) dropped out and three withdrew, leaving an on-treatment sample of 91. On-treatment patients were similar to drop-outs at baseline (mean [SD] age 49.5 [7.7] vs. 49.4 [9.2] yrs, p = 0.99; % male 66.0 vs. 88.0, p = 0.47; % with history of HTN 77.9 vs. 79.3, p = 0.71; duration [SD] of HTN 7.8 [9.1] vs. 6.6 [9.3] yrs, p = 0.57; and mean [SD] systolic BP at screening 181.2 [20.3] vs. 180.5 [25.9] mm Hg, p = 0.87), and there were no apparent differences in health beliefs (see the Table).

**Conclusion:** Health beliefs do not appear to differentiate patients who are more or less likely to comply with study-specific procedures in a randomized treatment trial.

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**Patients’ Prior Experience of Visiting an Emergency Department Affects Their Tolerance to Wait in the Future or Leave Without Being Seen**

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**Background:** Patients with minor complaints are often recurrent visitors to the emergency department (ED).

**Objectives:** Analyze the different tolerances of patients for waiting in the ED waiting room based on their prior visit history.

**Methods:** This is an IRB-approved survey of 400 adult patients waiting at least 15 minutes to be seen by a physician or physician extender. The patients were surveyed in the waiting area of an academic tertiary-care ED from April to August 2010. JMP 8.0 statistical software was used for data analysis. We hypothesized that there are no differences between different patient groups towards likelihood to leave without being seen (LWBS) and tolerances to waiting times.

**Results:** Different patient groups were defined as: first time ED patients: 6.25% - first time patient to any ED; new ED patients: 16.5% - visited other EDs but were new to our ED; return ED patients: 4.75% - repeat visitors to only our ED; multiple ED patients: 57.5% - multiple visits to multiple EDs. There was no significant difference between the first time ED patients and other groups with respect to the longest time that they would wait before considering LWBS (p=0.949). These patients had half the relative risk (RR) of LWBS as compared to others (95% CI 0.28 - 0.96). The expectation of the longest wait time before considering LWBS for new ED patients was shorter (p<0.001) than others (median 120 [IQR 60–120] vs. 180 [IQR 120–300] min). There was no difference between this group and other patients with respect to past history of LWBS. The expectation of the longest waiting time before considering LWBS was not significantly different for return ED patients compared to others (p = 0.7201). This group did not differ from other patients with respect to past history of LWBS, and the expectation of future LWBS. The expectation of longest waiting time prior to considering LWBS was higher (p=0.001) for multiple ED patients as compared to others (median 180 [IQR 120–300] vs. 120 [IQR 60–120] min), and they were more likely to LWBS in the past (RR =1.88, 95% CI 1.28 – 2.76). The RR for LWBS in the future was also higher for this group (1.31, 95% CI 1.08 - 1.60).

**Conclusion:** First time ED patients had the lowest risk of LWBS. Multiple ED patients not only had the highest risk of LWBS, but also the highest tolerance for long wait times.

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**Emergency Department Utilization Among Recently Insured and Uninsured Adults**

Adit A Ginde and Jennifer L. Wiler
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**Background:** Health care reform legislation has led to increased volumes of newly-insured adults; whereas, the economic recession has increased the uninsured population. While emergency department (ED) utilization among adults with and without health insurance has been studied, recent changes in insurance status have not been evaluated.

**Objectives:** To compare ED utilization patterns of recently insured and uninsured to stable insured and uninsured adults, respectively.

**Methods:** We analyzed 157,630 adult participants of the 2004–2009 National Health Interview Survey (NHIS). Health insurance status was categorized as “recently-insured” (currently-insured but lacked health insurance during the prior 12 months) vs. “stable insured,” and “recently-uninsured” (currently-uninsured but had health insurance during the prior three years) vs. “stable uninsured”. The primary outcome was ≥1 ED visit during the prior 12 months. We analyzed the data using multivariable logistic regression models, adjusting for demographics, socioeconomic status, health conditions, and access to care.

**Results:** Overall, 20.7% (95% CI 20.3–21.0) of insured and 20.0% (95% CI 19.4–20.7) of uninsured adults had ≥1 ED visit. However, 29.5% of the recently-insured, compared to 20.2% of the stable insured, had ≥1 ED visit. Similarly, 23.6% of the recently-uninsured, compared to 17.5% of the stable uninsured, had ≥1 ED visit. The composition of these groups varied by many characteristics, including age, race/ethnicity, socioeconomic status, and type of health insurance. After adjusting for all measured covariates, recent change in insurance status was independently associated with higher ED utilization for both recently-insured (OR 1.34, 95% CI 1.24–1.44 vs. stable insured) and recently-uninsured (OR 1.29, 95% CI 1.19–1.41 vs. stable uninsured). For the recently-uninsured, duration of time since last insured was inversely associated with ED utilization (compared to never insured: OR 1.91 for ≤6 months; OR 1.52 for >6 months-1 year; OR 1.34 for >1 year-3 years; and OR 1.28 for >3 years since last insured).

**Conclusion:** Recent changes in insurance status were associated with higher ED utilization. As health policy and economic forces create fluctuations in insurance status, potential surges in ED utilization may affect capacity and lead to increased crowding.

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**Patient Characteristics Associated With Inadequate Health Literacy in an Emergency Department Population**

Abhijit R Kantha1, Daniel L. Bennett1, Connie L. Arnold1, Terry C. Davis2, Alyson G. Hall1, and Donna L. Carden1
1University of Florida, Gainesville, FL; 2Louisiana State University Health Sciences Center, Shreveport, LA

**Background:** Health literacy (HL) is the degree to which individuals can obtain, process, and understand the basic health information and services needed to make appropriate health decisions. HL may affect an individual’s decision to seek emergency care and may influence his or her ability to act on information provided during the emergency department (ED) encounter or access
follow-up care. Despite its importance, little is known about the demographics and socioeconomic status associated with inadequate HL in the ED population.

**Objectives:** To determine the patient-level characteristics associated with inadequate HL in an ED population.

**Methods:** A cross-sectional study of those ≥ 18 years of age presenting to the Shands/University of Florida ED was conducted. The medically unstable and those with visual or hearing impairment were excluded. Patients were asked to provide informed consent for a survey assessing HL and personal characteristics using the Rapid Estimate of Adult Literacy in Medicine and a standardized data collection form. A sample size of 450 was needed to detect significant differences in ED patient HL. Contingency analysis for nominal and logistic fit for continuous variables was performed using JMP statistical software. Pearson’s and Likelihood ratio chi-square tests were performed, with a p < 0.05 considered significant.

**Results:** Of 492 included subjects, the median age was 38.0 years (25–54 years), 269 (54.7%) were female, 303 (61.6%) were Caucasian, and 137 (28.0%) were African American. Three hundred twenty-four subjects (65.8%) had adequate, 109 (22.2%) marginal, and 59 (12.0%) inadequate HL. Demographic and socioeconomic characteristics associated with inadequate HL included older age (p = 0.047), male sex (62.7%, p=0.013), African American race (45.7%, p < 0.0001), unemployment (72.8%, p = 0.048), being publicly or self-insured (50.9%, p = 0.0008), and having less education (p = 0.0001).

**Conclusion:** There were significant age, racial, sex, and socioeconomic disparities associated with inadequate HL in the ED population. Understanding disparities associated with inadequate HL may uncover strategies to improve ED relevant outcomes including overcoming barriers to effective outpatient care.

**162 Emergency Physician Utilization of Alcohol/Substance Screening and Discharge Tools**

Dyllon Martini1, Bonnie Kaplan2, Emily Hopkins2, and Kerry Broderick2

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**Background:** Alcohol and substance abuse have cost the United States millions in lives and money. Over 20 years, there has been much work demonstrating the efficacy of screening, brief intervention, and referral to treatment (SBIRT) in the emergency department (ED). Studies have shown that SBI provided by a physician can increase the likelihood of a patient following up for further treatment and significantly decreasing future abuse.

**Objectives:** By comparing results from a 1999 survey to a 2010 survey, we hypothesized that more emergency practitioners (EPs) are currently using a screening tool for alcohol/substance abuse (A/SA), more frequently intervening in patients with high-risk A/SA behavior, and using specific discharge instructions A/SA.


**Results:** Of the 516 responses, 480 (93%) included completed surveys. The two longitudinal survey results were similar with respect to age, location, number of years practicing, and sex. There was no significant difference between the median percentage of A/SA screened patients in 1999 versus 2010 (20% vs. 15%, p = 0.3). More EPs indicated that they use specific A/SA tools in the 2010 survey compared to the 1999 survey (26% vs. 19%, p = 0.03). In both surveys, the most commonly reported tool was the CAGE tool. There was no significant difference between the proportion of EPs who reported that they would always use discharge instructions that were specific for A/SA, if available (129/280 [46%] in 1999, and 238/480 [50%] in 2010, p = 0.4).

**Conclusion:** While there was no difference between the two surveys for most responses, in 2010 more EPs indicated that they use a specific tool for A/SA than in 1999. In both surveys, 90% of respondents reported that they have means of referral for A/SA; however, the screening median was only between 15–20%. With more education and social awareness of the repercussions of A/SA, it is extremely surprising to see no change in the implementation of screening and discharge instructions.

**163 Are Safety-Net Hospitals at Higher Risk of Closing Their Emergency Departments Than Non-Safety-Net Hospitals?**

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**Background:** The availability of health care in the United States, including emergency services, is largely governed by market forces. Emergency departments (EDs) are required to care for all patients regardless of ability to pay, and therefore may be highly vulnerable to variations in an unstable market. However, little is known about patient and hospital factors associated with ED closures.

**Objectives:** This study aims to analyze factors associated with closures to determine whether safety-net hospitals are at higher risk of ED closure compared with non-safety-net hospitals.

**Methods:** We obtained ED and hospital information from the American Hospital Association Annual Surveys for all general, acute, short-stay hospitals in the US from 1990 to 2007. We merged financial information for the hospitals from Medicare hospital cost reports. Safety-net hospitals were defined as hospitals providing more than double the Medicaid care compared with competing hospitals in the region. Outcomes considered in this study were ED opening and closing years. Discrete-time proportional hazard models were used to analyze risk factors for closure. In adjusted hazard ratios we controlled for factors including county population demographics, hospital characteristics, and market factors.

**Results:** Our study sample began with 2,466 urban EDs in 1990 and dwindled to 1,954 by 2007. A total of 2,814 hospitals were analyzed. Ten percent of closed EDs were safety-net providers, compared with 6% of those that remained open. A higher percentage of closed EDs were for-profit (28% vs. 14%, p<0.01), smaller in size (23,786 visits compared with 33,992, p<0.01), and in the lowest quartile of the profit-margin distribution compared with EDs that remained open (p<0.01). Unadjusted hazard ratios indicated that safety-net hospitals were 1.6 times more likely to close their EDs compared to non-safety net hospitals (p<0.01). The trend persisted even after accounting for other market-based forces in adjusted hazard ratios (HR 1.4, 95% CI 1.1–1.8).

**Conclusion:** This study shows that market forces influence ED survival. These findings are particularly compelling given that underserved populations utilize EDs at greater rates than other populations. Future policy initiatives must address our weakening ability to provide emergency care, particularly to vulnerable populations.

**164 Risk Factors for Closure of California Emergency Departments, 1998–2008**

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1UCSF-SFGH, San Francisco, CA; 2University of California, San Francisco, San Francisco, CA

**Background:** The U.S. population has experienced a significant number of emergency department (ED) closures over the past decade. Such closures may especially affect vulnerable populations.
**Objectives:** To examine which factors influence the closure of hospital EDs.

**Methods:** Retrospective cohort study of California hospital ED closures between 1998 and 2008, using hospital and patient level data from the California Office of Statewide Health Planning and Development (OSHPD), as well as OSHPD patient discharge data. We examined the effects of hospital and patient factors on the hospital’s likelihood of ED closure during the study time period using Cox proportional hazards models. We tested hospital-level patient demographics (e.g., proportion of patients who were white non-Hispanic, black non-Hispanic, Hispanic, or other non-Hispanic), payor mix, hospital ownership, teaching status, and whether or not the hospital was a trauma center. The outcome of interest was ED closure.

**Results:** There were a total of 401 hospitals, with 29 (7.2%) ED closures, during the 4,411 hospital-years of observation time available. In unadjusted analysis, county-owned hospitals (HR 2.79, p-value <0.001) and for-profit hospitals (HR 2.14, p-value <0.001) were more likely to close, as were hospitals that served higher proportions of black patients (HR 1.58, p-value <0.001) and Medi- caid recipients (HR 1.18, p-value <0.001). Facilities that closed their EDs also had fewer annual ED visits, hospital admissions, and Medicare patients. In fully-adjusted models (controlling for annual number of ED visits, hospital admissions, trauma center status, teaching status, and ownership), hospitals with a larger proportion of black patients (HR 1.35, p-value =0.003) and Medicaid recipients (HR 1.24, p-value <0.001) were most likely to experience an ED closure. Disproportionate share hospitals and safety-net hospitals, as defined by the CDC, were dropped from the model, as their effect was driven largely by Medicaid insurance.

**Conclusion:** Hospital characteristics such as size, teaching, safety-net, trauma center, and ownership status are less influential than the insurance and racial/ethnic mixture of the population the hospital serves. Hospitals with disproportionate shares of poorly-insured patients and minorities are at higher risk for closure.

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**165 Emergency Physicians Research Commonly Encountered Patient-Oriented Problems in the Proportion With Which They Are Encountered in the Emergency Department**

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**Background:** Emergency medicine organizations like the Society for Academic Emergency Medicine (SAEM) and the Institute of Medicine have called for more clinical research as a way of addressing the scarcity of research in emergency medicine (EM). We hypothesized that at least part of this scarcity is from the tendency of EM researchers like researchers in other fields, to focus on rarer conditions with higher morbidity instead of on more common conditions with less acuity. Previous investigations have examined funding and productivity in EM research, but whether EM researchers preferentially concentrate on certain patient-related topics is not known.

**Objectives:** This study compared the frequency of specific medical conditions presenting to emergency departments (EDs) nationwide with the frequency of emergency physician research on those same conditions.

**Methods:** This study is a structured retrospective review and comparison of two databases over 10 years. Principal diagnoses made by emergency physicians as reported by the National Hospital Ambulatory Medical Care Survey (NHAMCS) were compared to all first-author publications by emergency physicians as reported in PubMed between 1996-2006. Statistics included correlations and linear regression with the number of ED visits per diagnosis as the independent variable and the number of articles published as the dependent variable.

**Results:** During the 10-year study period, there was significant concordance between the frequency of presenting conditions in the ED and the frequency of research being performed on those conditions, with a high correlation of 0.85 (p < 0.01). More common ED diagnoses such as injury/poisoning, symptoms/ill-defined conditions, and diseases of the respiratory system accounted for 60.9% of ED principal diagnoses and 50.2% of the total research published in PubMed.

**Conclusion:** Unlike researchers in other fields, emergency physicians like researchers in almost the exact proportion as those conditions are encountered in the emergency department. The scarcity of emergency medicine research does not have to do with a skewed focus towards less common patient problems.

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**166 Emergency Department Impact of Mental Health Funding Cuts**

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**Background:** Emergency department (ED) crowding is a growing problem, with patient boarding a significant contributor to overcrowding. Decreased mental health resources lead to increased ED utilization for psychiatric complaints. Psychiatric patients board longer, require increased resources, and receive less care than provided at psychiatric facilities. Mental health budget cuts and the resulting effect on the ED is an understudied topic.

**Objectives:** Examine the role of decreased inpatient psychiatric beds on ED length of stay for patients on a psychiatric hold.

**Methods:** Single center, retrospective observational study of patients placed on a psychiatric hold during a one-year period at an urban academic medical center. All patients listed in the psychiatric social services database were included. Electronic medical records were reviewed and length of stay in hours was used as the primary outcome measure. Multivariate analysis was performed for variables including patient age, sex, prior psychiatric history, insurance status, drug screen results, and time between medical clearance and discharge for dates before and after decreased capacity at the county mental health facility.

**Results:** A total of 1017 patients were placed on a psychiatric hold during the study period (May 2008-May 2009). Of this population, 52% were male and 87% had known prior psychiatric history. The majority (59%) had Medicare or Medicaid coverage, with a smaller percentage (32%) having no insurance or county coverage, and a minority (9%) with private insurance. Length of stay in the ED was calculated both before and after the county budget crisis led to a 50% decrease in the number of community inpatient psychiatric beds. Prior to the decreased capacity the mean length of stay was 25.15 hours (median 17.5 hours), with an increase to mean length of stay of 29.9 hours (median 23.5 hours)
after the loss of inpatient beds. The regression analysis included 883 (85%) subjects with complete data. Decreased county facility capacity was independently associated with ED length of stay (B-coefficient 0.09, 95 CI 0.30–0.16, p=0.004).

**Conclusion:** Decreased capacity of a county-funded inpatient psychiatric facility led to a significant increase in length of stay for psychiatric patients in the ED. Insurance status was an independent predictor of length of stay, with insured patients requiring less time in the ED.

167 Service Disparities in Emergency Department Patients Presenting With Abdominal Pain Can Be Related to Body Mass Index

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**Background:** Disparities in health care have been at the forefront of health care discussions for many years. With the increasing obesity epidemic, disparities in care between obese and non-obese patients are becoming evident.

**Objectives:** Determine if service disparities exist between obese and non-obese patients presenting to the emergency department (ED) with abdominal pain.

**Methods:** A cohort of consecutive patients presenting to the ED with a chief complaint of abdominal pain were prospectively enrolled over two weeks. Self-reported heights and weights were used to calculate body mass index (BMI). Patient charts were later reviewed and data collected regarding mode of arrival, time to intravenous access (IV), number of labs and imaging studies ordered, type of imaging ordered, time to disposition, disposition, and admission length of stay. Patients were separated into non-obese (BMI < 30) and obese (BMI ≥ 30) groups. The obese group was further divided into obese and super obese (BMI ≥ 40). Statistical analysis was performed using ANOVA and paired t-tests.

**Results:** Three hundred patients were enrolled; 108 were excluded due to missing height or weight. Of the remainder, 101 were non-obese and 91 obese (22 were super obese). Ages were similar between groups. Time to IV was longer in super obese compared to non-obese (77 min vs. 50 min, p = 0.017). Non-obese patients arrived to the ED via ambulance more often (p = 0.045). Obese patients had longer times to disposition (322 min vs. 268 min, p=0.007). The number of imaging studies ordered was not significantly different, but the number of CTS ordered trended towards significance (40 in obese vs. 31 in non-obese, p = 0.064, 95% CI −0.008 to 0.273). Obese patients had a shorter hospital stay (4.2 days vs. 5.2 days), but this was not significant (p = 0.39).

**Conclusion:** An informal survey of staff in our ED revealed beliefs that obese ED patients use more resources. Our study partially supports this belief. Differences could reflect the diagnostic uncertainty in obese patients with abdominal pain as some bedside tests are limited by BMI. Limitations of our study include self-reported height and weight as well as the retrospective data collection. The question remains as to whether true pathology or diagnostic uncertainty is leading to conservative management and higher admission rates in obese patients.

168 Which Patients Leave the Emergency Department Without Being Seen

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**Background:** Increasing left without being seen (LWBS) episodes expose hospitals to medico-legal liability, negative publicity, and revenue loss.

**Objectives:** To study the characteristics of patients who are willing to leave the emergency department (ED) LWBS by a physician.

**Methods:** This is an IRB-approved survey of 400 adult patients waiting for more than 15 minutes in the ED waiting room of a university tertiary care hospital from April to August 2010. Descriptive, categorical correlation (Pearson’s test), and non parametric (Wilcoxon test) statistical analysis was done using JMP 8.

**Results:** The mean age of the survey cohort was 38.9 years (SD 14.8 years) and included 52.5% females. Nearly 58% of surveyed patients expressed the opinion that they would consider LWBS if wait times were too long. The mean acceptable waiting time for these patients before leaving was 221 minutes (SD 194 minutes). Patients who reported having left the ED in the past had 2.1 times higher risk of leaving in the future compared to others (95% CI 1.82 to 2.46; p<0.0001). Patients who said they would consider LWBS in the future had also expectedly experienced longer waiting times in the past (median 180 vs. 90, p<0.0001). Patients who expressed the intention to consider LWBS were significantly younger (median age 34 years) than those who did not (median age 43 years, p=0.0004). There were no sex differences with respect to the future intention of LWBS (p = 0.1805). African-American patients did report a higher incidence of LWBS in the past as compared to other races (RR = 1.48, 95% CI - 1.04 to 2.09; p =0.0328), but there were no racial or ethnic differences with respect to future intentions. Patients who were currently employed were more likely to consider LWBS in the future than the unemployed (RR = 1.27, IQR = 1.06–1.53; p<0.0009). Patient insurance status, having a primary care physician (PCP), and the nature and perception of the current complaint had no association with a patient’s attitude to consider LWBS.

**Conclusion:** Patients who have experienced long wait times in the ED in the past and patients who once LWBS are more likely to consider doing the same. These patients are likely to be younger and employed. The perceived acuity of illness, presence or absence of a PCP, and insurance status play no role in the consideration of LWBS.

169 Early Mortality Among Emergency Department Admitted Patients: Conditions, Procedures, and Charges From a Nationwide Sample

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**Background:** Various high-risk conditions are well known to emergency department (ED) practitioners and anecdotally taught by medical educators.

**Objectives:** To describe early inpatient mortality after ED admission and quantify the conditions, procedures, and hospital charges.

**Methods:** The Nationwide Inpatient Sample (NIS) is the largest all-payer care database in the United States from approximately 1045 hospitals in 38 states. 2006 data were analyzed to identify all inpatient deaths admitted via the ED, then further restricted to patients who died <= 2 days from presentation (25th percentile cut-off). We used clinical classification software coding to cluster ICD-9 codes into aggregate categories for meta-reporting. Proportions, medians, and interquartile ranges are reported.

**Results:** In 2006 there were 8,074,825 inpatient admissions in the NIS sample with 164,643 resulting in death. Of these, 105,662 were inpatient deaths after admission through the ED. The rate of death among these ED-admitted patients was slightly higher than all admitted patients (3.05 vs 2.04%). Median time to death in the ED-admitted cohort was four days (IQR 2–10 days). Early deaths (<= 2 days) occurred in 36,739 (34.8% of ED admitted deaths). The median age of early ED admitted deaths was 77 (IQR 62 to 85). Over half were a result of the following: septicemia (18.3%), respiratory failure (11.4%), acute cerebrovascular disease (9.4%), AMI (7.6%), pneumonia (4.7%), CHF (4.1%), and intracranial injury (4.0%). Procedures (23,291) included: intubation/ventilation (49.8% of procedures), non-cardiac vascular catheterization (6.9%), cardiovascular version (6.7%), and transfusion (5.2%). Median total charges for two days of care prior to death was $12,183 ($6,867–$21,754).
Conclusion: Of all hospital deaths in this nationwide cohort, >2/3 came through the ED. Extrapolating these numbers nationwide suggests approximately 180,000 deaths occur within 48 hours of the ED primarily in those infected, cardiopulmonary, and cerebrovascular conditions.

170 Assault Related Injuries Among Youth in an Urban Emergency Department
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Background: It is critical to understand the trajectory of youth who present to the emergency department (ED) for an assault-related injury.

Objectives: Understanding the past experiences with violence, substance use, gang involvement, and sexual risk behaviors of these high-risk youth compared to a matched sample of youth seeking care for other reasons will aid development of ED-based interventions for assault injured youth.

Methods: Youth 14-24 presenting to an urban ED from January - September 2010 with an assault-related injury completed a self-administered, anonymous, video-based survey. A systematically sampled comparison group matched by age and sex was recruited. Validated screening questions included demographics, substance use, past partner violence, weapon victimization, and gang involvement.

Results: Seven hundred and forty-five youth were screened (15% participation rate). Four hundred and five youth entered the ED with an assault-related injury during study hours, 297 completed screening (11% missed; 15% refused); 53.8% were male, 63.0% were African-American, 50% were in school, 69% receive public assistance, 3% endorsed gang involvement, and 26% were married/living with partner. No significant differences were found in demographics between groups. Of the assault-injured youth, 40% have children, 74% report recent weapon victimization, 18% weapon aggression, 60% marijuana use, 14% misuse of prescription drugs, 34% binge drinking, and 32% reported a prior STD. Bivariate analysis found no differences between the assault-injured youth and the matched comparison group on insurance status, living with a parent, working or being in school, alcohol use, or misuse of prescription drugs, and gun carriage. Logistic regression found victimization with a weapon (OR 4.3, CI 3.1-6.1), prior partner violence (OR 1.9, CI 1.4-2.7), prior STD (OR 1.6, CI 1.1-2.3), and problem use of marijuana (OR 1.6 CI 1.1-2.2) predicted an assault-related injury.

Conclusion: Assault-injured youth seeking ED care have high rates of recent violence compared to youths seeking ED care for other reasons. Many of these youths experiencing assault injury have children, and live with a partner currently. The ED may be critical time to interact with these high-risk youth to prevent violence in their own lives, as well as the lives of their family and children.

(Originally Submitted as a “Late-breaker”)

171 Human Immunodeficiency Virus Screening in a Cosmopolitan, Urban Emergency Department: Is the Yield Worth the Effort?
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Background: Using the emergency department (ED) as a site for HIV screening is controversial but has recently been mandated in several jurisdictions. The yield from such programs has been variable, and both their efficacy and cost effectiveness have been questioned.

Objectives: The purpose of this retrospective computer-assisted study was to report our experience with an established ED-based screening program for HIV in a cosmopolitan urban area with a presumed positivity rate far above the national average.

Methods: Our urban New York City teaching hospital (which is not a Level I trauma center) established a screening program for HIV in the ED in 2008. The facility is located just north of the East Village in Manhattan, an area known for its diverse population. The program, which was staffed 45 hours per week, approached relatively non-selected ED patients and offered free screening using the OraQuik saliva test which was then confirmed, if positive, by standard methods. The only exclusions were age greater than 65 years, known HIV positivity, and the inability to give consent. All patients found to be HIV-positive were offered assistance in locating appropriate health care providers.

Results: Over a 34 month period (Jan 2008–Oct 2010), a total of 12,321 patients were tested for HIV, 82 of whom were found to be positive on initial testing (0.7%). Of these, 76 were subsequently confirmed positive by Western Blot. Despite a predominance of females screened (7039 female vs. 5206 males), the majority of positive cases were males (56 males vs. 20 females). None were self-identified as transgender. The mean age of the 12,321 patients screened was 28 years. Twenty-three percent of the patients identified themselves as white, 22% black, and 32% Hispanic. Four percent of the patients were homeless or lived in a shelter. Thirty percent of the patients were uninsured. The total program cost for the period was $793,000. It cost $64 per individual screened. The cost per HIV case identified was $10,434.

Conclusion: Rates of HIV positivity were surprisingly low in this busy urban ED, and costs per case found were significant.

172 Trends in Advanced Radiology to Diagnose Pulmonary Embolus in Four Emergency Departments: 2006–2009
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Background: Studies have documented higher rates of advanced radiography use across U.S. emergency departments (EDs) in recent years using national datasets. However, the test indication for advanced radiography is absent from national data, making it difficult to know if radiography has increased for specific indications, such as ruling out pulmonary embolism (PE).

Objectives: We assess trends in the rate of PE-protocol CT and V/Q scanning in four hospitals, and also assessed if any increases in advanced radiography use were associated with lower overall diagnostic yield.

Methods: We conducted a retrospective chart review of all ED patients who had a CT chest or V/Q scan ordered to rule out PE from 1/06 to 12/09 in four hospitals in the Medstar health system. Data on quarterly testing rates were extracted from Axxyxi. Over the four hospitals, there were 15,414 scans ordered (14,009 CT, 1,405 V/Q). Average scans per 1000 ED visits varied from 13.54 to 18.12 between hospitals and was statistically significant (p = 0.02). The diagnostic yield varied from 4.0% to 8.0% between hospitals and was significantly different (p = 0.01). The hospital with the greatest scans per 1000 patients also had the highest diagnostic yield. There was no aggregate trend in PE testing rates over time; however, there was a significant decrease in PE testing rates in one of the hospitals over time (p<0.05) while there was no significant change in diagnostic yield within any individual hospital.
Conclusion: The use of advanced radiography as well as diagnostic yield varied significantly in this sample, indicating that different local care standards and disease prevalence may drive testing. Contrary to previous studies that have demonstrated increases in the use of advanced radiography, we observed a decrease in use at one out of the four hospitals in this study.

Methods: A cross-sectional survey of adults presenting to the Shands/UF ED was conducted. The medically unstable and those with visual or hearing impairment were excluded. Every sixth patient was asked to provide informed consent for a survey assessing HL using the Rapid Estimate of Adult Literacy in Medicine. Administrative data were processed using AHRQ’s Quality Indicator Windows Application Version 4.1a and SAS to flag ACSC diagnoses. Four hundred and fifty subjects were needed to detect significant differences in patient HL. Nominal data were tested using chi-square tests, and continuous variables were analyzed using ANOVA. JMP8 statistical software was used and p < 0.05 was considered significant.

Results: Four hundred ninety-two subjects were enrolled. Mean age was 40.5 years, 269 (54.7%) were female, 302 (61.6%) Caucasian, and 137 (26.0%) African American. Of these, 324 (65.8%) had adequate, 109 (22.2%) marginal, and 59 (12.0%) inadequate HL. When compared to those with higher HL, patients with inadequate HL were more likely to have had an ACSC hospitalization (p = 0.02), more ACSC admissions (p = 0.022), and to have been admitted for more than one preventable condition (p = 0.031).

Conclusion: Emergency department patients with low HL are more likely than those with higher HL to have preventable hospitalizations. Barriers to effective primary care in those with low HL should be defined.

Applying the Stage of Change Model to Emergency Department Patients With Diabetes
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Background: The Stages of Change Model (SCM) states that a successful change in behavior occurs gradually, with the patient moving from being uninterested, unaware, or unwilling to make a change (precontemplation), to acknowledging there is a problem and considering a change (contemplation), to deciding and preparing to make a change (preparation), to making the change (action), to maintaining the behavior change (maintenance). An intervention strategy may work for some patients and not for others based on their current SCM stage, and thus readiness to accept and enact change. For example, an intervention requiring complex lifestyle modification may work for patients in the action stage, but will likely not be effective for patients in the precontemplation stage, as they do not see their diabetes as a problem.

Objectives: To describe the stage of change of emergency department (ED) patients with diabetes seen in an urban, county hospital.

Methods: This was a prospective study of consecutive patients with a known history of diabetes seen in a Los Angeles urban county ED. Patients who were critically ill or unable to provide written informed consent were ineligible. Patients provided basic demographic information, and SCM category was determined by their agreement with a series of six questions about their desire to make changes with respect to their diabetes management (e.g., “I am intending to make changes in my diabetes management in the next month”).

Results: Of 219 total enrolled patients, basic demographic information was as follows: mean age 52.0 years (SD 12.0), 87.1% Hispanic, 64.9% Spanish-speaking, 52.2% female, mean SBP 135 (SD 21.9), mean DBP 78 (SD 17.4), and mean BMI 30.8 (SD 7.0). The distribution of SCM categories was as follows: precontemplation 6.4% (95% CI 3.5–10.5%), contemplation 3.7% (1.6–7.1%), preparation 26.5% (20.8–32.9%), action 55.3% (48.4–62.0%), and maintenance 8.2% (4.9–12.7%).

Conclusion: The overwhelming majority of patients (81.8%) were categorized as being in the preparation or action stages. Thus, our ED patients with diabetes represent a group who recognize their diabetes as a problem, and are eager to or have just made a change to increase control over their disease. Investigators and health advocates should be mindful of this advanced readiness to change when designing interventions to improve diabetes control in similar populations.
Early Hyperlactatemia Increases Risk of Organ Dysfunction Among Pediatric Emergency Department Patients With Systemic Inflammatory Response Syndrome
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Background: Hyperlactatemia (serum lactate level ≥4 mmol/L) is used to risk-stratify and treat adults at risk for septic shock and death. Pediatric sepsis guidelines do not endorse the use of lactate as a screening test, and its diagnostic utility in early pediatric sepsis has not been evaluated.

Objectives: To test whether hyperlactatemia is associated with organ dysfunction (OD) in pediatric emergency department (ED) patients with systemic inflammatory response syndrome (SIRS).

Methods: This was a prospectively enrolled cohort study of children <19 years in a pediatric ED. Inclusion criteria were SIRS by triage temperature and heart rate, and ED phlebotomy. Patients with inborn errors of metabolism were excluded. Point-of-care venous lactate was measured during phlebotomy; treating clinicians were blinded to results. Treatment was per usual standard of care; additional data were collected with standardized data abstraction. Our primary outcome measure was 24-hour OD, defined by International Pediatric Sepsis Consensus Conference criteria. Test characteristics, including likelihood ratio (LR), were calculated. Additional associations were calculated with Fisher’s exact test.

Results: Two hundred and thirty-nine eligible subjects were enrolled. Fifty percent had OD within 24 hours; no subjects died. Sixty-nine percent were admitted, 8% to critical care; 23% had sepsis. Of these, 174 had hyperlactatemia (mean of 4.57 ± 2.21 mmol/L) vs. 65 without lactate elevation (mean of 0.85 ± 0.71 mmol/L). Logistic regression models revealed that hyperlactatemia was associated with ED interventions, including intravenous (IV) antibiotic use (p = 0.002) and IV fluid volumes ≥40 ml/kg (p = 0.02).

Conclusion: Early hyperlactatemia was significantly associated with OD in pediatric SIRS, even in the absence of hypotension in the ED. Our findings suggest that lactate testing has potential to accelerate ED care of early pediatric sepsis.
Background: Adolescent females present to pediatric emergency departments (PED) with complaints concerning for sexually transmitted infections (STIs). Even with a complete medical/sexual history and exam, accurate diagnosis of STI requires lab testing. Prior studies show that ED and primary care physicians are less likely to obtain sexual histories from adolescent white females than blacks. It is hypothesized that a similar disparity is present in STI testing between white and black adolescent females being evaluated for chief complaints concerning for STIs in a PED.

Objectives: Determine if there is a difference in STI testing between black and white adolescent females presenting to a PED with chief complaints concerning for STI.

Methods: Retrospective cohort study of 13–21 year old females who presented to a PED with chief complaints concerning for STI over a two month period. Exclusion criteria: pregnancy, trauma, medically unstable. Trained reviewers blinded to study objective abstracted sexual history and STI testing from redacted medical records. Additional abstraction collected chief complaints, medical history, and provider characteristics. Predictors of primary outcome of obtaining STI testing were determined using univariate and multivariate logistic regression.

Results: Three hundred and thirty visits were included for analysis. Mean age for whites (n = 131) was 15 yrs (SD = 2.0) and for blacks (n = 199) was 17 yrs (SD = 2.0). Race and sexual activity were independent predictors of STI testing. Race, sexual activity, and gynecological chief complaint were significant predictors (p<0.05) of STI testing in a multivariate model that controlled for age, presence of chronic medical condition, and provider demographics. Whites were less likely to receive STI testing (AOR 0.30, 95% CI 0.10–0.92). Patients with a gynecologic chief complaint (AOR 2.88, 95% CI 1.15–7.20) and reporting sexual activity (AOR 28.3, 95% CI 8.23–98.0) were more likely to receive STI testing.

Conclusion: Sexually active white adolescent females with chief complaints concerning for STIs have testing performed less frequently than blacks. As STIs are only able to be definitively diagnosed with testing, this disparity indicates that white adolescent females are being under evaluated for STIs in this PED setting. Supported by Institutional Clinical and Translational Science Award, NIH/NCRR Grant Number 5UL1RR026514-02.

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Background: Many of the 10,000 victims of snakebite each year in the United States are under 18 years of age. The snakebite management of this population has not been studied as extensively as adults. There may be particular characteristics specific to this population that could affect their emergency medical treatment.

Objectives: Our goal was to define the trends and characteristics of a large pediatric snakebite victim population over a 10 year period.

Methods: Observational study of telephone calls (with follow-up when possible) to all U.S. poison centers (National Poison Data System) for snakebite victims under 18 years from 2000–2009.

Results: There were 20,285 pediatric snakebites (31.4% of all snakebites). The number of bites/year decreased 23.7% from the high of 2,323 in 2000 to the low of 1,772 in 2009. For the entire study period, 69.8% were male. Their ages were 0–2 years (28.6%), 2–5 (18.9%), 6–12 (40.6%), 13–17 (29.7%), and unknown (3.0%). As expected, 74.1% of all bites occurred during the five months from May through September. July had the largest number of bites (16.8%), and December had the fewest (1.3%). Every state reported at least one pediatric snakebite during the study period. Florida (11.9%), Texas (10.1%), and California (5.5%) had the most, and North Dakota (0.1%), Alaska (five bites), and Hawaii (only one bite) had the least. The type of snake was recorded as non-venomous (39.4%), venomous (29.7%), and unknown (30.9%). Copperhead snakes were the leading identified venomous species at 11.0%. Only 10.4% were rattlesnakes, 0.9% were coral snakes, and 0.6% were exotic snakes. Only 1.8% had major clinical effects, 20.8% had moderate effects, 62.4% had minor effects, 5.7% had no effects, and 9.3% had unknown effects. Over the 10 year study period there were three pediatric deaths.

Conclusion: This is the largest study of pediatric snakebite victims in the United States. Males living in the southern U.S. during the summer make up the highest risk group. Fortunately, despite appropriate parental fears, major effects and death are rare. The chief limitation of this study is the dependence on the accuracy of the poison center charts based on caller information. This study reveals the characteristics and trends of pediatric snakebite victims.

181 Knowledge, Attitudes, and Practice of Emergency Health Care Workers in the Assessment of Child Maltreatment, Maputo, Mozambique
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Background: In Mozambique, and other low-income countries, there are little data on the extent of child maltreatment (CM). Emergency department (ED) health care workers (HCWs) play an important role in recognizing, treating, and preventing CM.

Objectives: To assess the knowledge, attitudes, and practices of HCW on CM in the Mavalane General Hospital (MGH) ED, Maputo, Mozambique.

Methods: A 25 minute, pilot-tested verbal interview questionnaire was administered, after informed consent, to doctors and nurses who worked in the MGH ED during the one-month study period. MGH is a 265-bed hospital with a 24-hour ED located on the outskirts of Maputo city that sees 220,000 patients annually. Data were entered into SPSS 14.0 and frequencies were calculated.

Results: Of the total 56 HCWs at MGH, 49 consented to participate. Of these 49, 30% were male and the majority were physicians (60%). Fifteen percent of HCW did not know the symptoms of CM, 71% have never received any training on CM, and 90% of HCWs have never heard of “shaken baby syndrome”. Most HCWs (60%) agreed they lack sufficient education to effectively treat CM cases. Only 10% of HCW recognized and managed a CM case. The majority of HCW (58%) stated the MGH ED is ill-equipped to respond to CM cases; while 58% stated there is no CM protocol, 26% confirmed the existence of a general sexual violence protocol. Most HCWs (60%) didn’t feel capable of caring for abused children and 73% said follow-up for victims is difficult. Most HCWs (45%) agreed ED based multidisciplinary teams should assist in CM care. The majority of HCWs (62.2%) acknowledged their crucial role in CM, while 11% said dealing with CM is the police’s domain. Most HCWs (58%) were unaware of a referral system for CM, and 9.5% of HCWs didn’t know where to refer victims for psychological support. HCWs requested formal CM training, diagnostic/treatment protocols, pooling CM resources, and creating a CM surveillance system to improve CM victim care.

Conclusion: Health care workers felt ill-equipped to adequately treat CM victims due to knowledge gaps in detection, diagnostics, treatment modalities, and follow-up and referral mechanisms, and inadequate resources in the MGH ED, including treatment and referral protocols and surveillance or victim detection systems. CM detection and treatment at MGH can be improved by addressing both the educational gaps and the health system organization.
Clinical Effects of Acute Desvenlafaxine (Pristiq®) Ingestion by Young Children
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Background: Desvenlafaxine (Pristiq®) is a serotonin-norepinephrine reuptake inhibitor approved by the FDA in 2008 for the treatment of depression in adults. It is also under review as the first non-hormonal based treatment for the vasomotor symptoms associated with menopause. In adults, its major adverse effects are nausea, dizziness, insomnia, and constipation. However, there are no published studies of its adverse effects on the pediatric population.

Objectives: To study the clinical effects of accidental desvenlafaxine ingestion by young children.

Methods: A retrospective, observational study of single substance ingestions in children under age 6 years from January 2008 through March 2010. This chart review included all poison center calls in one state for these children who were followed to a known outcome.

Results: There were 56 children who met the inclusion criteria. They were aged 1 month to 6 years in age. Ingestion doses ranged from 25 mg to 1000 mg. Fifty children (95.0%) were asymptomatic. The only symptom seen in more than one child was nausea/vomiting (5.3%). Four children each had one of the following symptoms (1.8% each): dry mouth, bradycardia, drowsiness, and somnolence. Twenty-eight (50.0%, 95% CI: 37.3–62.7%) were managed at home with observation. The other half were managed in the health care facilities. Of those treated in health care facilities, 14 children were given activated charcoal. Only one (1.4%, 95% CI: 7.4–25.7%) was admitted overnight and discharged with no additional treatment within 24 hours.

Conclusion: This is the first study of ingestion of desvenlafaxine by young children. Only about 10% of these children had any symptoms and all were mild or moderate. All children had good outcomes (100%; 95% CI: 93.3–100%). However, low numbers, inconsistent follow-up, and reliance on caller information limit this study. This small study suggests that in the ED most of these children may be safely discharged home without treatment. More studies are needed to determine appropriate emergency management of ingestions in this age group.

Accuracy of Automatic Urinalysis in the Screening of Febrile Infants for Pediatric Urinary Tract Infection
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Background: Urinalysis (UA) is a cornerstone in the evaluation of febrile infants, because the UA predicts the likelihood of a positive culture. Unfortunately, UA is a subjective and labor-intensive human process. Recently, fully automated machinery has provided the opportunity for potentially faster processing and more accurate results. Little published information exists regarding the accuracy of automated urinalysis in diagnosing pediatric urinary tract infection (UTI).

Objectives: Our goal was to determine the diagnostic performance of automated UA in the diagnosis of UTIs in febrile infants.

Methods: This was a retrospective cohort study, conducted at a suburban tertiary care pediatric emergency department, approved by the Inova institutional review board. Data for consecutive children under two years of age who had catheterized UA and culture performed over a 5-month period were reviewed. Diagnostic performance of automated UA was calculated for urine “dipstick” and microscopy results. A positive (gold standard) urine culture was defined as ≥100,000 cfu/mL of a single uropathogen. Children already on antibiotics were excluded from analysis. Diagnostic performance outcomes were generated with GraphPad Prism (version 5.00 for Windows, GraphPad Software, San Diego California). Alpha was set at 0.05 where appropriate.

Results: Sixty-one of 871 (7%) consecutive urine samples were positive. Leukocyte esterase demonstrated a sensitivity of 63% (95% CI: 52–74%), specificity of 95% (95% CI: 94–97%), and positive likelihood ratio (LR+) of 13. Nitrite demonstrated a sensitivity of 30% (95% CI: 20–42%), specificity of 99% (95% CI: 98–99%), and LR+ ≥50. A receiver operating characteristic curve of WBC/mL vs. positive culture identified maximum sensitivity (74%), maximum specificity (86%), and an LR+ of 5.4 at 7.5 WBC/mL (AUC 0.86; p < 0.01).

Conclusion: Urine leukocyte esterase determined by an automated reader provided only moderate sensitivity in identifying infants with bacteriuria. Automated microscopy proved to be only marginally better. Automated UA does not preclude the continued necessity of a urine culture in children under the age of two years, irrespective of the UA results.
185 Spicing Things Up: Pediatric Exposures to Synthetic Cannabinoids
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Background: A new and potentially harmful intoxicant known as “Spice” has recently emerged. Spice refers to a number of herbal mixtures, sold as “herbal incense,” which may contain any of several synthetic cannabinoids, and are smoked for potential euphoric effect. Marketed under a variety of names, they are readily available to children, despite some trends toward legal prohibitions. These herbal blends contain a variety of compounds that function as potent cannabinoid receptor agonists. Only limited understanding of the clinical effects and adverse outcomes associated with Spice is available.

Objectives: To describe the demographics, clinical effects, and medical interventions associated with pediatric and adolescent exposures to Spice.

Methods: This is an observational case series. A retrospective chart review was conducted of all ingestion Spice exposures in patients 0–19 years of age reported to a poison control center during the 12 month period that ended October 31, 2010. Data collected and reviewed included age, sex, evaluation at a health care facility, clinical effects, medical interventions, outcomes, and disposition.

Results: A total of 39 reports of pediatric Spice exposures occurred during the study period. Patients had a median age of 18 years (range 11–19, IQR 3), and 72% (n = 28) were male. The most commonly reported adverse effects were: anxiety 26% (n = 10), agitation 26% (n = 10), nausea/vomiting 23% (n = 9), lethargy 21% (n = 8), tremor 15% (n = 6), and confusion 13% (n = 5). Ten percent (n = 4) suffered hallucinations and 8% (n = 3) had seizures. Of the 24 patients (62%) who were evaluated at a health care facility, 23% (n = 9) required medical interventions including naloxone, benzodiazepines, supplemental potassium, supplemental oxygen, and intravenous fluids; and 17% (n = 4) were admitted to the hospital.

Conclusion: In this study, children and adolescents exposed to Spice showed a broad range of adverse effects. Many required emergency medical interventions and hospitalization.

186 Prevalence of Sexually Transmitted Infections in Symptomatic Adolescent Females in a Pediatric Emergency Department
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Background: Adolescents frequently utilize the emergency department (ED) with complaints suggestive of a sexually transmitted infection (STI). However, studies have found that even when patients present with such complaints, STI testing is not always conducted. This may be partially due to the fact that the prevalence of STIs within this population has been understudied, and therefore, providers may not be aware that their patients are at risk.

Objectives: The purpose of this study was to determine the prevalence of STIs in adolescent females presenting to a pediatric ED with chief complaints suggestive of an STI.

Methods: This was a prospective prevalence study of a consecutive sample of female adolescents aged 14–19 years presenting to a pediatric ED with symptoms of lower abdominal, pelvic, or flank pain and/or genitourinary (GU) complaints. Patients were tested for Neisseria gonorrhoeae (GC) and Chlamydia trachomatis (CT) using a urine PCR test (APTIMA COMBO 2 Assay), and for Trichomonas vaginalis (TV) using a vaginal rapid antigen test (OSOM Trichomonas Rapid Test). Data were analyzed using STATA 11.0.

Results: During the study period, 276 patients met inclusion criteria, of whom 236 underwent STI testing. The prevalence of any STI was 26.3% (95% confidence interval [CI] 20.6, 31.9) among patients who had STI testing performed. Assuming all eligible patients who did not undergo STI testing were not infected with any STIs, sensitivity analysis still revealed an STI prevalence of 22.5% (CI 17.5, 27.4). Of the patients who underwent STI testing, CT was the most prevalent (19.7%; CI 14.3, 24.9), followed by TV (9.9%; CI 5.7, 14.0) and GC (3.5%; CI 1.1, 5.9). Nineteen percent of patients infected with CT were co-infected with TV and 6.7% with CT were co-infected with GC. Logistic regression revealed that there was no significant association between STI and patient age or chief complaint. There was, however, a significant association between STI and black race (OR 15.2; CI 3.6, 64) and lack of private insurance (3.14; CI 1.53, 6.43).

Conclusion: A large percentage of adolescent females presenting to a pediatric ED with lower abdominal or GU symptoms had an STI. Given the high prevalence of STIs in this population and the potential morbidity associated with infection, STI testing should be considered in all adolescent females presenting to the ED with lower abdominal and/or GU symptoms.
Conclusion: The incidence of patients ≤ 21 years of age with a diagnosis of cellulitis or abscess increased 164% between 2001–2008. The proportion of visits for cellulitis or abscess increased at a rate of 14% per year from 2001–2008. From 2007–2008, 26% underwent I&D; SMX/TMP was the most commonly used antimicrobial whether or not I&D was performed.

Background: Fever is one of the most common presenting complaints of children in the emergency department (ED). A crucial aspect of ED management of children is assessment for presence and degree of fever. Rectal thermometry (RT) is a standard method of temperature measurement in children <36 months of age. Temporal artery thermometry (TAT) is a relatively new method in which temperature is measured by passing a temperature probe across the forehead. It is unclear if TAT is accurate in children.

Objectives: We hypothesize that TAT measurement will differ significantly from RT measurement in the same child. We compared TAT with standard RT in detection of fever in children <36 months old.

Methods: This was a retrospective evaluation of 147 febrile children <36 months old treated consecutively in an urban medical center. In this ED, patients undergo triage with temperature assessment by TAT (TAT 2000, Exergen Corporation, Watertown, MA) and are transferred immediately to a pediatric ED where children <36 months undergo a second temperature assessment by RT (Turbo Temp Thermometer, Alaris Medical Systems, San Diego, CA). The TAT and RT measurements from the same patient were extracted from patient charts to provide paired TAT/RT used to determine if these values differ using a paired t-test. Fever was defined as RT equal or greater than 38°C (100.4°F). Exclusion criteria included use of antipyretics more than 10 minutes prior to the second (rectal) temperature assessment, more than a 35 minute delay between TAT and RT assessment, or use of active or passive cooling measures such as tepid bathing prior to RT. Statistical calculations were performed using Stata 10 IC (Statacorp, College Station, TX) with alpha = 0.05 and beta = 0.8.

Results: The mean difference between TAT and RT was 1.99°F (95% CI 1.75–2.23). The mean RT was 102.36°F (95% CI 102.14–102.58) and the mean TAT was 100.36°C (95% CI 100.08–100.65). TAT measurement of 102.2°F (39°C) or greater only occurred in patients whose RT was >105.0°F.

Conclusion: In children <36 months, TAT fails to detect fever to a statistically and clinically significant degree. Children with fever detected by RT typically have a TAT measurement less than 100.4°F. TAT incorrectly indicates that they are afebrile. The average difference in TAT and RT was 1.99°F, which is clinically significant. Clinicians should use RT rather than rely on TAT when accurate detection of febrile temperature is important.

188 Comparison of Results of Temporal Artery Thermometry and Rectal Thermometry in Febrile Children
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189 Predictive Ability of “Smelly Urine” for Urinary Tract Infection (UTI) in 1 To 36 Month Old Children
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190 Predictors of Successful Telephone Contact After Emergency Department-Based Recruitment Into a Multicenter Smoking Cessation Cohort Study
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Background: It is not known whether reporting of smelly urine is useful to make a diagnosis of urinary tract infection (UTI) in young children.

Objectives: To determine whether parental reporting of smelly urine is associated with UTI in young children.

Methods: A prospective cohort study was performed from 2009/07/31 to 2010/10/15 in the emergency department (ED) of a tertiary care pediatric hospital. All children aged between 1–36 months who visited the ED from 10 AM until 6 PM during week days, and for whom a urine culture (UC) was prescribed for suspected UTI (i.e., unexplained fever, irritability, or vomiting), were eligible. Exclusion criteria were: antibiotics, other than for prophylaxis, given over the last 48 hrs; diabetes or other metabolic disease; or ureterostomy or urinary catheter in place. For all participants, a standardized questionnaire was administered to the parents by a research assistant, asking whether their child’s urine had been smelly over the last 48 hrs. Collection of UC was done as usual in the ED. The primary outcome was a UTI defined as > 106 bacteria/mL of a single pathogen in UC collected from midstream void; or > 50 x105/mL of a single pathogen in UC obtained through bladder catheterization; or any amount of gram negative bacteria in UC obtained from suprapubic aspiration (or > 10 x106 of gram positive/mL).

Results: Three hundred and one children were initially enrolled in the study excluding a posteriori because UC was prescribed but not done (10), collected by bag (30), and/or showed gross contamination (20). Thus, 245 children participated to the study. Their mean age was 13 months (SD ±8), and 57% were female. A “smelly urine” was recorded by parents in 92 (38%) children and UTI criteria were fulfilled in 36 (15%). On logistic regression, smelly urine was associated with the risk of UTI (OR 3.1 95% CI 1.5–6.5). This association remained significant when adjusted for age, sex, and past history of UTI (OR 2.8; 95% CI 1.3–5.9). Smelly urine showed a sensitivity of 0.61 (95% CI 0.45–0.75) and a specificity of 0.67 (95% CI 0.60–0.73), leading to a positive likelihood ratio of 1.82 (95% CI 1.32–2.52) and a negative likelihood ratio of 0.38 (95% CI 0.38–0.89).

Conclusion: The presence of smelly urine increases the probability of UTI among young children evaluated for presumed UTI. However, it does not have a sufficiently high specificity or sensitivity to definitively rule in or out the diagnosis of UTI.

Background: Emergency department (ED) studies often require follow-up with subjects to assess outcomes and adverse events. Identifying baseline characteristics associated with successful contact may help identify subjects at risk for lost-to-follow-up.

Objectives: To identify baseline subject characteristics associated with successful contact at three time points after the index ED visit within a sample of cigarette smokers.

Methods: We recruited a prospective cohort of current adult smokers at 10 U.S. EDs and collected baseline demographics, smoking profile, substance abuse, health conditions, and contact information. Site investigators attempted contact using primary and secondary telephone numbers and designated alternate
contact persons at 2 weeks, 3 months, and 6 months to assess smoking prevalence and quit attempts. Subjects were paid $20 for successful follow-up at each time point. We analyzed data using logistic and Poisson regressions.

**Results:** Of 375 recruited subjects, 270 (72%) were contacted at 2 weeks, 245 (65%) at 3 months, and 217 (58%) at 6 months. Overall, 175 (47%) were contacted at 3 of 3, 71 (19%) at 2 of 3, 62 (17%) at 1 of 3, and 66 (18%) at 0 of 3 time points. There were no statistically significant predictors of successful follow-up at 2 weeks. At 6 months, the strongest predictors of successful contact were older age (odds ratio [OR] 1.3, 95%CI 1.1–1.5 per increase of 10 years); female sex (OR 1.8, 95%CI 1.2–2.7); private insurance (OR 2.2, 95%CI 1.2–4.0 vs no insurance); no drug use (OR 3.6, 95%CI 2.0–6.5); and ≥3 smoking-related illnesses (OR 1.8, 95%CI 1.1–3.0 vs 0 illnesses). Results at 3 months were similar. The covariates most predictive of the total number of successful contacts were age (incidence rate ratio [IRR] 1.1, 95%CI 0.99–1.1 per increase of 10 years); female sex (IRR 1.1, 95%CI 0.98–1.3); and no drug use (IRR 1.4, 95%CI 1.1–1.8); only drug use was statistically significant.

**Conclusion:** Successful contact 2 weeks after the ED visit was 72% but decreased by 6 months to 58%, despite modest financial incentives. Variables related to the primary study purpose (smoking cessation) and amount of contact information provided were not associated with successful contact. Prediction of who will have successful follow-up is difficult, with non-drug users being the most likely to be contacted.

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**191 The Reliability of Repeated Measures of the Time Constant for Post-exercise Phosphocreatine Recovery Using a Weighted Intraclass Correlation Coefficient**

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**Background:** The time constant (tau) of post-exercise phosphocreatine (PCr) recovery is directly related to oxidative metabolism and is used to study in vivo energy metabolism. The reliability of measuring tau-PCr using magnetic resonance spectroscopy as a clinical trial endpoint is unclear. The reliability may be related to the magnitude of exercise and it may be improved by performing repeated measures during each session. We theorize that tau-PCr calculated from repeated low-intensity exercise protocol will be more reliable than tau-PCr calculated from a single low-intensity exercise protocol, and it will have equal or greater reliability than tau-PCr calculated from a single high-intensity exercise protocol.

**Objectives:** The goal of this pilot study was to assess the point estimates of the reliability of tau-PCr for these different exercise protocols.

**Methods:** Five healthy volunteers performed the same procedure twice one week apart. It consisted of three sequential low-intensity exercises followed by a high-intensity exercise of isokinetic plantar flexion while in a 3T clinical magnet. 31P spectra of the posterior calf muscles were acquired every 10 seconds during the 8-minute recovery period of each exercise protocol using a pulse-and-acquire free induction decay sequence. The PCr fraction was normalized and fit to a monoexponential curve. We calculated the intraclass correlation coefficients (ICC) using linear mixed-effects models that incorporated weights (inverse variance) for the tau-PCr estimates. Weighting the tau-PCr estimates by their precision has not been previously reported for analyzing tau-PCr data.

**Results:** The average decrease in PCr values from baseline to end-exercise for the low-intensity exercise for visit 1 and visit 2 were 13% ± 5% and 13% ± 4%, respectively. The average decrease in PCr values from baseline to end-exercise for the high-intensity exercise for visit 1 and visit 2 were 89% ± 4% and 83% ± 15%, respectively. Paired plots of tau-PCr for visit 1 and visit 2 are shown in the Figure. The ICCs are listed in the Table.

**Conclusion:** Tau-PCr can be measured reliably. This study supports that repeating measures during each visit increases the reliability of tau-PCr. The reliability of tau-PCr derived from repeated low-intensity exercise on each visit is similar to the reliability of tau-PCr derived from a single high-intensity exercise on each visit.
Background: The study of emergency medicine is challenged by the degree to which scientific conclusions can be generalized across populations, locations, and events.

Objectives: Our study, examining substance use, aimed to determine if differences existed between our sample group and the larger population of eligible patients who utilize the emergency department (ED).

Methods: All patients ≥18 years old who presented to four EDs were considered for the study. Patients were approached in a standard and consecutive manner, and screened for participation in a randomized controlled trial (RCT), which involved computerized screening, brief intervention, and referral to substance-specific treatment (SBIRT) programs for alcohol, tobacco and illicit drugs. Demographic variables included age, sex, and ethnicity. Patients were excluded if they were cognitively impaired, too ill to participate, unable to be reached for follow-up, or declined interest. We used univariate analyses (chi-square or t-tests) to compare demographic characteristics of those who screened positive for substance use and were enrolled to those who were not enrolled.

Results: Of the 5,538 adult patients who presented during research shifts, 2,384 (43%) were screened for substance use; of these, 720 (30%) screened positive for substance use, with 470 (65%) accepting enrollment into the RCT. Enrolled patients, compared to un-enrolled patients, were slightly older (41.1 vs 37.5 years; t = 3.59, p < 0.001) and less likely to be African American (25% vs 27%; χ² = 11.18, p < 0.01). When comparing enrolled patients only to those who declined, the same pattern of results was observed (t = 3.06, p < 0.05; χ² = 13.03, p < 0.01, respectively). No other difference was found between groups on sex or ethnicity. The resulting enrolled sample included 186 cigarette-only users, 40 alcohol-only users, 26 drug-only users, 60 cigarette and alcohol users, 99 cigarette and drug users, and 56 cigarette, alcohol, and drug users.

Conclusion: The sample of substance users enrolled into the RCT under-represented younger and African American patients. Investigators must be careful to take action, when appropriate, to correct skewed representativeness in their samples and to appropriately note limitations to generalizability in their studies.

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Background: Burns are dynamic injuries that often progress over time. Mesenchymal stem cells (MSCs) have been used to treat several types of injury, due to their ability to replace damaged tissue and secrete growth factors. It is unclear whether MSCs can reduce burn injury progression.

Objectives: We hypothesized that intravenous injection of human MSCs would reduce the percentage of unburned interspaces undergoing necrosis by at least 20% in a rat comb burn model.

Methods: Sprague-Dawley rats (300 gm) were anesthetized with inhalational isoflurane and their skin hair was clipped and treated with a depilatory cream. Two comb burns were created on each animal with a brass comb with four rectangular prongs preheated in boiling water and applied for 30 seconds, resulting in four rectangular 10 x 20 mm full thickness burns separated by three 5 x 20 mm unburned interspaces (representing the zone of ischemia). Animals were randomized to receive 1 million MSC/rodent or vehicle once per 10 days for 1 week. Wounds were observed at 2, 5, and 7 days after injury for gross visual evidence of necrosis in the unburned interspaces. Full thickness biopsies from the interspaces were evaluated with H&E staining 5, 7, and 2 days after injury for evidence of necrosis. The percentage of interspaces that progressed to necrosis were compared with chi-square tests. A sample of 20 rats (60 interspaces) per group had 80% power to detect a 20% difference in necrotic interspaces.

Results: Forty comb burns (120 interspaces) were created on 20 rats evenly distributed between the study groups. The percentage of control and MSC treated unburned interspaces undergoing necrosis at 2, 5, and 7 days after injury were: 77+/−18 vs. 63+/−14 (P = NS); 80+/−16 vs. 68+/−15 (P = NS); and 63+/−17 vs. 68+/−15 (P = 0.14), respectively. There were also no significant differences.
between the groups in the percentage of grossly necrotic interspaces at 2, 5, and 7 days.

Conclusion: Intravenous injection of humans MSCs one hour after injury does not significantly reduce the percentage of unburned interspaces that progress to necrosis in a rat comb burn model.

195 **Residents as Teachers: Emergency Medicine Residents Are as Effective as Faculty in Medical Student Simulation Debriefing**

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**Background:** Emergency medicine (EM) programs have incorporated human simulation to enhance medical student education. EM faculty commonly observe the simulation and facilitate the post-case debriefing. The amount of faculty manpower needed for observation and debriefing can be a significant limiting factor to the use of simulation.

**Objectives:** The goal of this study is to compare the effectiveness of EM residents and EM faculty in debriefing.

**Methods:** The required EM medical student clerkship at Indiana University School of Medicine includes a two-hour simulation session. In this study, groups of 5-6 students participated in three mannequin-based simulation sessions (pediatric, medical, trauma) with a 15 minute case followed by a 15 minute debriefing. EM faculty and residents alternated as the facilitator for each debriefing session. The medical students then completed the Debriefing Assessment for Simulation in Healthcare (DASH) participant form, created at The Center for Medical Simulation at Harvard. The DASH results for both EM faculty and residents were compared using the mean score overall and by the type of case. We pared using the mean score overall and by the type of case. We used mixed effects regression to test for differences between overall faculty and resident scores (p = 0.433).

**Results:** There were a total of 273 DASH forms completed, with 132 EM faculty evaluations and 141 EM resident evaluations. The overall faculty mean score was 6.52 out of seven and overall resident mean score was 6.44 out of seven. There were no statistically significant differences between overall faculty and resident scores (p = 0.433).

**Conclusion:** In our study, EM residents were as effective as EM faculty in debriefing medical students in a mannequin-based simulation experience. The use of EM residents in debriefing can increase the amount of simulation incorporated into EM undergraduate curricula, while providing a teaching experience for the EM resident.

196 **Increasing Diversity and Growth of Simulation-related Research in Emergency Medicine Over the Past 5 Years**

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**Background:** Since the Institute of Medicine recommended simulation to improve patient care and safety in 2000, emergency medicine (EM), researchers have been investigating simulation as a new field of interest. In 2008 and 2009, recognizing the growing importance of simulation, the Society for Academic Emergency Medicine (SAEM) hosted consensus conferences and established the Simulation Academy. However, evidence documenting the growth and diversity of EM simulation research is currently absent.

**Objectives:** This study evaluates the growth and diversity of EM simulation research from 2006 to 2010.

**Methods:** This retrospective cohort study was IRB-exempt. From 2006–2010, all research abstracts at the International Meeting on Simulation in Healthcare (IMSH), SAEM, and the American College of Emergency Physicians (ACEP) annual assemblies were selected from the supplemental issues of *Simulation in Healthcare*, *Academic Emergency Medicine*, and *Annals of Emergency Medicine*. Using search keywords containing the root “simulat-” in titles and contents, simulation-related abstracts at SAEM and ACEP meetings were preliminarily identified. IMSH abstracts from 2007–10 (2006 issue was not published) were identified as authored by EM researchers based on the first or second author’s departmental affiliation from listing queries and internet search. Subsequently, a blinded EM simulation faculty member reviewed each abstract, excluded those deemed non-related to simulation or EM, and categorized each remaining abstract into pre-determined research categories (Table 1).

**Results:** Of 5,324 abstracts (SAEM = 2,908; ACEP = 2,216; IMSH = 400), 191 were identified as both EM and simulation-related (SAEM = 98; ACEP = 30; IMSH = 63). The faculty excluded two abstracts from SAEM, and one from ACEP. Graph 1 shows increasing proportion of simulation-related abstracts at SAEM and ACEP assemblies. At IMSH, EM proportion increased from 8.7% in 2006 to 21.7% in 2010, with a mean annual growth of 4.3%. Graph 2 shows the increasing number of EM simulation research categories, from a mean of 3.5 in 2006 to 10.3 in 2010 and a mean annual increase of 1.4 categories per assembly. Mean proportion of simulation-related abstract is only 1.4% in ACEP and 3.4% in SAEM, with mean annual growths of 0.4% and 1%, respectively.

**Conclusion:** Growth and diversity of EM simulation research is illustrated by steadily increasing numbers of related abstracts and research categories at three major national assemblies over the last five years.

**Table 1: EM Simulation Research Categories**

| 1. ACLS/PALS |
| 2. Airway |
| 3. Communication Skills |
| 4. Departmental Flow/System Design |
| 5. Knowledge Base Competence |
| 6. Participants' Physiology |
| 7. Patient Safety |
| 8. Procedural Competence |
| 9. Residency Assessment/Curriculum |
| 10. Simulation Equipment |
| 11. Simulation Feasibility |
| 12. Simulation Methodology |
| 13. Specific Clinical Questions |
| 14. Team Training |
Impact of Base Camp: Simulation-based Multidisciplinary Team Training for Pediatric Emergency Medicine Fellows

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Background: Pediatric emergency medicine (PEM) fellows must acquire necessary knowledge and skills to lead a multidisciplinary team under crisis conditions. Without consistent training in teamwork, however, many PEM fellows rely on mock codes or rare resuscitation events for experiential learning. In order to introduce and practice teamwork behaviors and skills, we organized a 2-day multi-institutional, multidisciplinary program, BASE Camp 2010: Basic Training for Pediatric Emergency Medicine.

Objectives: To determine the skills PEM fellows identified as essential for effective teamwork, and to characterize potential barriers to integrating these principles in practice.

Methods: Using qualitative methods, we conducted two focus group interviews (n = 16). Fellows described their teamwork experiences at BASE Camp, how they would integrate team principles into future practice, and prior resuscitation experiences.

Responses to open-ended questions were recorded, transcribed, and analyzed by a constant comparative method in Atlas.ti (qualitative data analysis program). Data were cross-coded to ensure agreement. Themes were identified by content analysis. The study was IRB-approved, and all subjects consented.

Results: Seventeen PEM fellows (12 first and 5 second year) from 10 fellowships in NY, CT, and RI participated in BASE Camp (Oct 23–24, 2010). Twenty-nine percent were male. Five themes emerged from an inductive interpretation of coded data segments. Barriers to integrating the five core principles are categorized by: Hierarchy (n = 16): discomfort asserting team principles when resuscitation events are rare. Communication (n = 8): difficulty implementing communication strategies with colleagues untrained in teamwork principles.

Conclusion: Fellows acquired basic teamwork principles during BASE Camp training and are eager to incorporate these behaviors and skills into future practice despite the barriers identified. BASE Camp may be useful to overcome these challenges, and our results will help inform future iterations of our educational intervention.

Comparison of Simulation and Lecture to Teach Core Content and Increase Residents’ Confidence

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Background: Use of human patient simulation has increased in all levels of medical education. Responding to our residents’ requests for more active learning opportunities, we have increased our use of simulation-based experiences.

Objectives: In this study, we compared the effectiveness of simulation to a traditional lecture for teaching core content to emergency medicine residents. We hypothesized that the context-specific active learning format of the simulation-based experience would improve learning and confidence.

Methods: A simulation exercise and a lecture on the topic of cardiovascular medication (CVM) toxicity were developed and presented as part of the residents’ weekly conferences. Residents completed a 24-item written pre-test and were then randomized to participate in either the lecture or the simulation. Following the experience, all residents took a written post-test and completed a survey that assessed confidence in managing CVM toxicity in a clinical setting and their perceptions of the effectiveness of the training modality (measured on a 1–10 scale with 10 being the most confident/effective). The groups then crossed over so that each resident had an equivalent educational experience, and confidence and effectiveness were again assessed.

Results: A total of 30 emergency medicine residents participated. The groups did not differ in their level of training or pre-test performance (average 12.1 vs 12.6; p = 0.32). Both groups had an average increase in post-test score of 4.2 (+/−2.4). However, the simulation group did show a significantly greater increase in confidence than the lecture group (+2.66 vs +1.64, p = 0.006 after the first experience and 2.0 vs 0.89, p = 0.04 after the second). Residents also perceived simulation to be a significantly more effective teaching modality for this topic (6.1 vs 8.3, p < 0.001).

Conclusion: Simulation was equivalent to traditional lecture in improving residents’ performance on a knowledge-based written test. However, residents who completed the simulation showed a significantly greater increase in confidence in their own ability to manage a patient with CVM toxicity in the clinical setting. These results suggest that simulation may increase confidence in clinical skills more than traditional lecture format while delivering equivalent knowledge content, and further transition to active learning experiences may be warranted.

Simulator for Process Interrogation and Error Detection in Acute Care Medicine

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Background: Many industries use simulation for error detection and process refinement.

Objectives: To design emergency medicine (EM) simulation software with dynamic responsive physiology, objective performance metrics, and thought process mapping through automated interface events transcription, and to trial software simulator with dynamic vital signs, neurologic status changes, and temporal effects to clinical actions (e.g., obtaining initial information, ordering labs, administering meds, viewing ECGs, etc.). Software databases contain effect parameters for nearly 300 functions and actions (including 100+ medications).

Methods: IRB- approved study. Subjects (MS I to III) had 15 minutes to evaluate, manage, and diagnose each of three cases: one practice (V-tach), and two test (AMI and PCP pneumonitis). All information seeking, treatment, diagnosis, and consult actions were automatically logged, along with concurrent patient status and time markers, and all events were transcribed and assessed by predefined “best practice” algorithms of optimal care. Descriptive statistics were performed on test cases for various measures of accuracy and efficiency, and the System Usability Scale (SUS) was administered to measure subject’s assessments of the software.

Results: 882 discrete actions from seven subjects over both test cases (AMI and PCP) were recorded and analyzed. The cases averaged 63.0 (85% CI 52.8, 73.2) actions and 10.63 (8.62, 12.60) min to complete. All subjects provided correct diagnoses, with average confidence of 86.2% (77.8%, 94.7%), yet missed 37.5% (29.5%, 45.5%) of all critical actions. In all cases, the software identified instances of flawed thought processes through missed pre-identified critical actions, improper sequence of data acquisition, excessive resources used to obtain diagnosis, inappropriate tests, and management errors (e.g., performing dangerous or incorrect actions). SUS scores averaged 82.5 (78.3, 86.7), suggesting the software was engaging and easy to use.

Conclusion: Low cost simulation software can evaluate clinical skills and can, adjusting for practice variation, identify flawed thought processes, incorrect or dangerous actions, and out of sequence clinical management behaviors. Future uses of the software will be to study error detection and self-correction and to examine its effectiveness for standardized EM simulation training and testing.

200 Factors Associated With Resident Choice of an Emergency Medicine Career: Results From the ABEM Longitudinal Study of Emergency Medicine Residents
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Background: The American Board of Emergency Medicine (ABEM) Longitudinal Study of Emergency Medicine Residents (LSEMR) queries a randomized cohort of emergency medicine (EM) residents. It is designed to identify residents’ goals, motivation, and effects of training on satisfaction with changes over time.

Objectives: To identify factors in resident choice of EM as a career and any change in relative importance of these factor during training.

Methods: Data from 2006 LSEMR survey were analyzed to identify factors that influence residents’ decisions to select EM training over other medical specialties. This study also sought to determine if there is a change in relative importance of these factors over time during residency. Responses were reported using a 5 point Likert scale. Descriptive statistics were used to analyze results.

Results: There were 162 respondents, 63% male. Twenty-nine percent self-identified as a minority. The most common factors identified as influencing decision to elect EM training were compatible colleagues (82%), defined working hours (90%), diversity of experiences (97%), opportunity to spend more time with family (90%), interest in EM clinical knowledge (89%), intellectual challenge (83%), personal temperament for EM (84%), and need for challenge and stimulation (82%). The most common residents also considered were anesthesiology (49%), IM (70%), FM (38%), and surgery (74%). The following factors correlated highly with continued resident satisfaction of EM as a career choice: having exciting and challenging work (92%), having control over personal and professional life (97%), earning a comfortable living and lifestyle (87%), being respected for my clinical expertise (82%), and being relatively independent (79%).

Conclusion: Factors identified by residents in choosing EM as a career were centered around professional challenges, diversity of experiences, and control over lifestyle issues. Over half had seriously considered either surgery or internal medicine, as well. Factors correlating highly with continued satisfaction in resident career choice centered around clinical challenges, expertise, and independence and remained important during training. Knowledge of these factors may be useful to program directors and faculty when counseling medical students and in resident selection.

201 Residency Applicants Prefer an Online System for Scheduling Interviews
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Alameda County - Highland, Oakland, CA

Background: Residency administration can be overwhelmed when scheduling residency interviews. Not only do applicants express frustration with busy signals and voicemails, but they often have to coordinate interviews with multiple programs at once. A novel online scheduling system, eliminating the need to spend time with multiple phone calls and voicemails, might make the scheduling process faster and easier.

Objectives: To determine satisfaction using online scheduling compared with traditional methods.

Methods: This is a retrospective analysis performed on a sample of applicants offered interviews at an urban county emergency medicine (EM) residency. They received an anonymous survey asking them about their experiences and satisfaction with the new online interview scheduling system as compared with their experiences at other programs. They were asked to provide the estimated time to schedule with the online system compared to the average time to schedule using other methods. In addition, they were asked on a five point anchored scale to rate their satisfaction from “unsatisfied” to “satisfied”. Groups were compared using the Wilcoxon signed-rank test.

Results: Of 171 applicants, 121 completed the survey (70.8%). Applicants were scheduling an average of 13.3 interviews. Median time to schedule an interview for applicants using the online system was 10 minutes (IQR 5–15) from the interview offer, as compared with a median of 60 minutes (IQR 12–300) for other programs (p < 0.0001). In addition, 83% of applicants reported satisfaction with the online system, compared to 20% satisfied with the typical system (p < .0001). Applicants were also more likely to state that they preferred scheduling their interviews using the online system rather than typical method (74% vs. 4%, p < 0.0001). Among those applicants who had to change their plans, 87% were satisfied with the online system’s approach to rescheduling, compared with 18% with the typical system (p < 0.0001).

Conclusion: Using an online scheduling system clearly is associated with higher satisfaction among applicants. If such a scheduling system became more widespread, the residency scheduling process, which can be fraught with frustration, delays, and difficulty, might be improved.

202 Academic Career Selection in Emergency Medicine Residents
John Burkhardt, Terry Kowalenko, and William Meurer
University of Michigan, Ann Arbor, MI

Background: The future of academic emergency medicine is based on the continued successful recruitment and cultivation of new faculty from emergency medical residents. Little data exist as
to the rate of residents initially choosing an academic career path, or which residency programs are best situated to create new faculty.

**Objectives:** Our study was designed to initially describe the current career demographics of graduating residents, and then through statistical analysis, investigate likely programmatic factors that affect academic career selection.

**Methods:** Data were collected via an online survey sent to emergency medicine residency program directors. Responders were asked to describe their graduates and their program characteristics over the past 5 years. We received 103 total survey responses with complete data from 65 (76 with enough data for descriptive demographics). Relevant covariates were tested for association with academic career entry using t-tests or ANOVA.

**Results:** Survey responses indicated that 26.1% of residents chose an academic career (community 57.1%, fellowship 13.5%, military/VA 2.6%, other 0.6%), with an approximately normal distribution. There were no significant differences found between programs when presence of mentorship programs, career track programs, or city size were analyzed. Multivariable linear regression analysis demonstrated a statistically significant increase in academic career choice among programs located in the Northeast/Midatlantic and the Midwest, larger programs (>12 residents/year), and programs with increased resident academic productivity (presentations given, non peer-reviewed publications), but did not demonstrate a difference between 3 and 4 year programs (Table 1). Overall, the model fitted using the above variables accounted for approximately 30% of the variation seen between programs (adjusted R² 0.295).

**Conclusion:** Our data indicate that program region, size, and research productivity were the best indicators of academic career selection. Our model provides a good description of programmatic factors affecting career choice, and we believe that individual resident factors likely account for the remainder of the differences in career choice.

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**Table 1 (Academic Career)**

<table>
<thead>
<tr>
<th>Model Parameters</th>
<th>Beta</th>
<th>95% Confidence Interval for Beta</th>
<th>p value</th>
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<td>West</td>
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<td>Academic Productivity</td>
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<td>0.009</td>
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<td>Beta</td>
<td>95% Confidence Interval for Beta</td>
<td>p value</td>
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<td>Configuration PGY 1–4 and 2–4</td>
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<td>0.638</td>
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<tr>
<td>Size less than 8 (per resident class)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Size 9 to 11</td>
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<td>0.593</td>
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<tr>
<td>Size greater than 12</td>
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<td>2.895 20.87</td>
<td>0.011</td>
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</table>

**203 Residency Applicant Communication Preferences and Use of Social Media in Residency Application: A Pilot Study**

Cullen Hegarty, Stephanie Taft, Felix Ankel, Bradley Gordon, and Sharmila Raghunandan

**Background:** Digital communication and use of the internet and social media (e.g., Facebook) sites are becoming a common means of communication between applicants and residency programs.

**Objectives:** The objective of our study was to determine the preferred means of residency communication and the value to applicants of other residency media such as a residency website and Facebook.

**Methods:** We surveyed applicants who interviewed at the Regions Hospital Emergency Medicine Residency Program during the 2009–2010 academic cycle. An anonymous and voluntary survey was included in each applicant’s interview packet. The five question survey asked the applicant to rank preferences for communication between the program and applicant during the interview season and to rank preferences of receiving information about the program from sources such as an internet website and Facebook page.

**Results:** Thirty-two of 103 applicants responded to the survey. Of these, 68% (42/62) preferred to receive program information via e-mail, followed by 26% (16/62) preferring the website, and 3% (2/62) preferring surface mail. If a program had questions about an applicant’s file, 90% (56/62) preferred contact by e-mail, and 10% (6/62) preferred a phone call (preferably by cell phone). For changes or updates about the residency program, 95% (59/62) of applicants preferred receiving this information via e-mail, followed by surface mail (29% or 18/62) and the website (27% or 17/62) as second choices. Eighty-five percent (51/60) of respondents reported that they had a Facebook account, although few used this as a resource.

**Conclusion:** E-mail is the most preferred method of communication of applicants. The residency program website is also of value for applicants looking for information about the program. Many applicants have Facebook accounts, but few use this as a method to communicate with residency.

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**204 Level of Disaster Preparedness in Patients Visiting the Emergency Department: Results of the Civilian Assessment of Readiness for Disaster (CARD) Survey**

Nicholas True¹, Juliana Adedoyin², Frances Shofer³, Eddie Hasty², and Jane Brice¹

¹University of North Carolina School of Medicine, Chapel Hill, NC; ²Virginia Commonwealth University School of Medicine, Richmond, VA

**Background:** Disaster preparedness of the general public is thought to be poor. Patients seeking care in public hospitals are often resource-limited populations who have in past disasters become the most vulnerable.

**Objectives:** We sought to determine the personal disaster preparedness of emergency department (ED) patients and to identify predictors of low levels of preparedness. We hypothesized that vulnerable populations would be better prepared for disasters.

**Methods:** We conducted a prospective cross-sectional survey of patients seeking care in a public university hospital ED (census 65,000) over an 8 month period. The survey was developed using...
the 15 items from the Federal Emergency Management Agency’s disaster preparedness checklist as well as demographics: age, sex, race, income, education, special needs, and household characteristics. Subjects were excluded if they were mentally impaired, in custody, institutionalized, or non-English speaking. Summary statistics were used to describe general preparedness and chi-square tests were used to compare preparedness by demographics.

Results: During the study period, 943 patients completed the survey. Participants were predominantly male (57%), Caucasian (64%), middle-aged (mean 45 years), and high school graduates (83%). Fifty-six percent had an annual income below $40,000. Median household size was 2. Seventeen percent reported having special needs, and 17% were single parents. In general, the majority of participants were not prepared. Only 299 (32%) had an existing family emergency preparedness plan, 262 (30%) had an established family meeting location, 393 (42%) had food and water for 3 days, 451 (53%) had >75% of the 15 items on the checklist, and 318 (34%) had both food and water and >75% of items. Level of preparedness was not found to be associated with age, sex, education, race, income, parenting, or special needs (p>0.05 for all).

Conclusion: The majority of participants in this survey were unprepared for a disaster. Only a third of the surveyed population had food and water for three days and 75% of the recommended preparedness items. Though single parents and those with special needs are traditionally vulnerable populations, no association with higher preparedness was found. Current disaster preparedness education has not been effective in reaching this survey population.

205 Biological Disaster Preparedness in the Age of Molecular Diagnostics: A Survey of Community Laboratory Capabilities Across the United States
Kevin Jenq1, Amir Mohareb1, Jesse Yang3, Autumn Downney2, Alex Kecojevic3, Yu Hsiang Hsieh1, Karen C Carroll2, Charlotte A Gaydos1, Jan A Nowak4, Chris Mangal2, and Richard E Rothman1
1Johns Hopkins School of Medicine, Baltimore, MD; 2Johns Hopkins Bloomberg School of Public Health, Baltimore, MD; 3Johns Hopkins Hospital, Baltimore, MD; 4Northshore University Health System, Evanston, IL; 5Association of Public Health Laboratories, Silver Spring, MD

Background: Emergency departments (EDs) serve at the front lines for evaluating patients with suspected exposures to emerging infections (EIs) or bioterror (BT) pathogens, but current protocols by the Centers for Disease Control and Prevention (CDC) require that suspicious isolates be sent out to public laboratories for definitive pathogen identification. This protocol is time-consuming and potentially overwhelmed during large outbreaks. Unharnessed local resources, in the form of community molecular diagnostic laboratories, could aid testing efforts during large outbreaks.

Objectives: We set out to assess the collective technical capacities of local laboratories across the United States which could be leveraged in the event of a BT or EI.

Methods: This is a cross-sectional, regionally weighted survey of U.S. hospitals with greater than 250 beds. A semi-structured survey instrument was developed and validated by experts in molecular diagnostics with input from two specialty organizations; the survey was administered using a web-based method or phone interview by trained research assistants. Sites with more advanced molecular diagnostic capabilities were queried about molecular diagnostic capabilities, planning and training, and experiences with the H1N1 pandemic (as a surrogate for future EIs).

Results: In this ongoing survey, 25 of 44 total (57%) respondents reported having laboratories with molecular diagnostic capabilities for infectious diseases, of which 60% had qPCR technology, and 72% had written procedures for responding to EI/BT agents. Nearly half reported having personnel trained in identification and response to EI agents, and two-thirds had personnel trained for BT agent identification. During the H1N1 pandemic, 60% reported using CDC or FDA-approved PCR tests for detecting pandemic influenza with 70% reporting ≤24 hour turnaround time for results (vs. 0% for state laboratory result turnaround in ≤24 hours).

Conclusion: Preliminary results from this ongoing national survey indicate that over half of the sampled sites have the basic infrastructure (RT-PCR capability) to perform testing that traditionally is relegated to public health laboratories. This study suggests that community molecular diagnostic laboratories may be an important unharnessed national resource which could aid ED clinicians and hospitals in the event of an outbreak.

206 An Integration of Lecture and Scenario-based Disaster Preparedness Curriculum in a Large Urban Emergency Medicine Training Program
Michael Redlener, Ani Aydin, Silas Smith, Ian Portelli, Ashley Colucci, and Robert Hessler
New York University, New York, NY

Background: Disaster preparedness education for emergency medicine residents (EMR) is not a standard or integrated element of the emergency medicine curriculum. There are limited data supporting appropriate educational methods to teach residents this material.

Objectives: To implement and evaluate an innovative disaster preparedness educational intervention for EMRs at a large urban residency program, and to identify areas of improvement in disaster medicine education.

Methods: A curriculum integrating focused topic lectures and small group scenario discussions was developed by a team of attending physicians and residents to teach hospital-based disaster response. Topics included 1) radiological emergencies, 2) chemical emergencies, 3) incident command structure (ICS), 4) triage, and 5) mental health. Pre- and post-test surveys were administered to all EMRs to evaluate effect on attitude, confidence, and knowledge about identified topics. Demographic and prior experience data were collected. Responses were scored and compared using paired t-tests in SPSS.

Results: Forty-four pre-tests and 36 post-tests were available for analysis (eight lost to survey non-compliance). Participants reported that disaster preparedness in general (86.4%) and specific topics (ICS 93%, triage 98%) are important aspects of EM training. Respondents reported an increase in confidence in ICS (27% to 67%, p < 0.001) and START/JumpSTART Triage (20.5% to 60.5%, p < 0.001). Participants also demonstrated a statistically significant increase in knowledge-based questions (mean score 8.86 to 10.81, p < 0.001). Key areas of improvement were radiological management (mean score 1.56 to 2.44, p < 0.001) and triage (mean score 3.06 to 3.51, p < 0.05).

Conclusion: Emergency medicine residents believe that disaster preparedness is an important component of training. Participants in this intervention demonstrated improved knowledge and confidence with regard to disaster preparedness topics. This conference design served to reinforce key learning points in a broad array of disaster preparedness areas. Future improvements will include more focused topic areas and increased hands-on practice.

207 Health Care Worker Availability in a Mass Casualty Incident: Impact of the 2009 H1 N1 Influenza Pandemic
Katherine Martens, Renee Petzel, Christina Hantsch Bardsley, Giles Simpson, and Christine Stake
Loyola University Chicago, Maywood, IL

Background: Chemical, biological, radiological, nuclear, and explosive (CBRNE) accidents or terrorist acts can cause mass
casualty incidents (MCIs). Health care workers (HCWs) may be unwilling or unable to participate in CBRNE MCIs. In March 2003, emergency department (ED) HCWs were surveyed on willingness to work during MCIs. From spring 2009 to June 2010, HCWs experienced the H1N1 pandemic.

**Objectives:** Objectives were to determine current willingness of ED HCWs to participate in CBRNE MCIs and to compare 2010 results to 2003. Additional objectives were to assess the effect of the H1N1 pandemic on ED HCW willingness to participate in MCIs and attitude regarding pandemic management and vaccination.

**Methods:** In April 2010, a survey of ED HCWs was done at the same urban, tertiary care, Level 1 trauma center, teaching hospital previously surveyed in 2003. The survey tool about willingness to participate in MCIs was identical to the 2003 tool and was followed by H1N1 questions. HCWs were asked if the H1N1 experience influenced willingness to participate. The tool was distributed to all ED/trauma physicians, nurses, technicians, secretaries, and security staff. Completion was voluntary and anonymous.

**Results:** Response rate was 78% (98 of 126). Differences in 2010 and 2003 HCW willingness to remain at work were statistically significant in each CBRNE MCI scenario (paired t-test, p < 0.05). If HCWs needed to come in from home, overall there was a further 6% decrease in willingness to participate in 2010 versus 13% in 2003. Following the H1N1 experience, 27% of HCWs felt more comfortable in a biological MCI. 11% less comfortable, 62% no effect. Fifty-nine percent felt ED patient and HCW needs were met most of the time during the H1N1 MCI. Regarding planning and provision of information for HCWs, 64% felt the hospital and 46% felt public health agencies performed adequately. Mandatory HCW vaccination was supported by 49%; H1N1 vaccine was received by 56%.

**Conclusion:** In 2010, an increase in HCW willingness to participate in each CBRNE MCI scenario was found. Most HCWs did not feel an effect from their H1N1 experience. The low mortality of 2009 H1N1 may have been a factor. Interval study site factors that may have been important were improved training and implementation of support policies (child, elder, and pet care) addressing barriers identified in 2003. Further study of all HCWs' attitudes on CBRNE MCI is needed.

### Percent of HCWs Willing to Remain at Work in an MCI

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<th>MCI</th>
<th>2010</th>
<th>2003</th>
<th>Difference</th>
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<tr>
<td>Chemical</td>
<td>79%</td>
<td>74%</td>
<td>+5</td>
</tr>
<tr>
<td>Biological</td>
<td>74%</td>
<td>70%</td>
<td>+4</td>
</tr>
<tr>
<td>Nuclear</td>
<td>72%</td>
<td>69%</td>
<td>+3</td>
</tr>
<tr>
<td>Trauma</td>
<td>94%</td>
<td>86%</td>
<td>+8</td>
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</table>

### 208 Asthma and Family Income Are Associated With Increased ED Utilization in Children With Sickle Cell Disease

**Jeffrey A Glassberg.1, Jason Wang1, and Michael R DeBaun2**

1Mount Sinai, New York, NY; 2Vanderbilt University, Nashville, TN

**Background:** Sickle cell disease (SCD) is the most common genetic disease in America. In patients with SCD, the presence of asthma has been associated with an increased frequency of pain episodes and acute chest syndrome (ACS). Low household income has been associated with increased asthma morbidity. The relationship between asthma income, and emergency department (ED) utilization for SCD has not been explored.

**Objectives:** We tested the hypothesis that in children with SCD, the presence of asthma or low income is associated with increased ED utilization for pain or ACS.

**Methods:** A baseline assessment of children with SCD who participated in the Silent Cerebral Infarct Trial was conducted. Between December 2004 and June 2010, extensive socio-demographic, clinical, and laboratory data were recorded. Three year history of ED use for pain and ACS were included for all participants. Household income was treated both as a continuous variable and a dichotomized covariate based on the 2010 Health and Human Services federal poverty guidelines. Negative binomial and Poisson regression were used to investigate potential associations between asthma diagnosis, income, and ED utilization for pain and ACS (both confirmed by medical record review).

**Results:** The sample size was 1003 patients ranging from 5-15 years of age, with 3009 patient-years of data. Presence of a doctor diagnosis of asthma was associated with a 24% relative increase in the frequency of ED visits for pain (p = 0.02; 91 vs 69 visits per 100 patient-years, mean difference 21, 95% CI 3.2-39.5). A negative binomial regression that included asthma, income, and other variables known to have an effect on SCD morbidity demonstrated that baseline hemoglobin, fetal hemoglobin level, asthma, and household income were significantly associated with the frequency of ED visits for pain (p = 0.05, p = 0.03, p = 0.02, and p = 0.02, respectively); however, only asthma was significantly associated with ED visits for ACS (p = 0.01). The interaction term between asthma and income was not significant (p = 0.7).

**Conclusion:** In individuals with SCD, both asthma and low income are independently associated with an increase in the rate of ED use associated with pain.

### 209 Comparing a Breath-actuated Vs a Conventional Continuous-output Nebulizer in Treating Acute Asthma in a Pediatric Emergency Department: An Ongoing Randomized Controlled Trial

**Jerri Rose1, Sandra Cancelliere2, Patricia Matye2, and MaryAnn O’Riordan1**

1University Hospitals Case Medical Center, Cleveland, OH; 2Rainbow Babies And Children’s Hospital, Cleveland, OH

**Background:** A breath-actuated nebulizer (BAN) is a newer type of nebulizer that creates aerosol only during a patient’s inhalation. Theorized advantages of BANs over conventional continuous-output nebulizers (CNs) include delivery of a higher percentage of aerosolized drug doses to patients’ lungs and decreased loss of drug to the environment. Little is known regarding the effectiveness of BANs in treating pediatric asthma patients. No known studies have compared patient satisfaction with BANs versus CNs.

**Objectives:** The purpose of this ongoing trial is to compare effectiveness of, and patient satisfaction with a BAN versus a standard CN for treatment of acute asthma in a pediatric emergency department (ED).

**Methods:** Participants are children aged 1 to 17 years presenting to a pediatric ED for treatment of acute asthma. Following an initial bronchodilator treatment with a CN, participants requiring further treatments are randomly assigned to receive treatments with either a BAN or a standard CN until meeting established discharge criteria. In each group, participants are treated with an identical regimen of frequent bronchodilator treatments and oral dexamethasone, with clinical reassessment every 20 minutes according to a standardized asthma care algorithm. In addition, participants complete a survey regarding satisfaction with the assigned device at the end of their ED visit.

**Results:** A total of 178 children aged 1 to 17 years have participated to date (89 in the BAN group; 89 in the CN group). Study groups are similar in terms of demographics and baseline asthma severity. The initial mean Pulmonary Index Score is 8.2 for participants in the BAN group, and 8.1 for participants assigned to the CN group. Overall, 33 (37%) of 89 participants in the BAN group have required hospitalization compared with 41 (46.1%) of 89 in the CN group. Completed satisfaction surveys are available for 177 participants (99.4%). Forty-five (50.6%) of 89 respondents in the BAN group strongly agreed that they would feel comfortable receiving treatments with the same type of nebulizer in the future, compared to 23 (26.1%) of 88 respondents in the CN group.

**Conclusion:** Among participants thus far, the hospitalization rate for acute asthma is lower in those assigned to the BAN group.
compared to those in the CN group. A greater percentage of participants have indicated a high level of comfort with use of the BAN.

(Originally Submitted as a “Late-breaker”)

210 Decontamination of Asthma Spacer Devices for Re-Use in a Paediatric Emergency Department

Carol Blackburn, Sandra Bennett, Paul Staunton, Elaine Donnelly, Sinead O’Donnell, Sean Walsh, Niamh O’Sullivan, and Ronan O’Sullivan

Our Lady’s Children’s Hospital Crumlin, Dublin, Ireland

Background: Spacer devices are the delivery method of choice of inhaled bronchodilators for acute exacerbations of asthma in children but are not used ubiquitously. Manufacturer recommendations and local institutional infection control policy dictate that spacers are for single patient use only.

Objectives: To determine the best method of decontamination of spacer devices to facilitate reuse in the emergency department (ED).

Methods: Experimental study design, three spacer types tested (Babyhaler, Aerochamber Child Mask, Volumatic). Four organisms were selected (Pseudomonas aeruginosa, Klebsiella pneumoniae, Staphylococcus aureus, Streptococcus faecalis). Each spacer was inoculated with a test organism as per standardized protocol followed by decontamination using one of five Methods: (i) Washing in soapy water at 44°C. Spacers were then sampled for remaining test organism by standardized method, pipetted onto blood agar, incubated, and read. (ii) Washing in soapy water followed by disinfection in 2% sodium hypochlorite solution (Milton), rinsed in water and air-dried. (iii) Dishwasher at 60°C. Spacers were then sampled for remaining test organism standardized method, pipetted onto blood agar, incubated, and read. (iv) Steam sterilizer on standard cycle. (v) Autoclaved at 121°C. Spacers were then sampled for remaining test organism standardized method, pipetted onto blood agar, incubated, and read.

Results: Decontamination using soapy water at 44°C was inadequate to clean spacers for reuse as determined by significant colony growths on blood agar (colony counts varied from 100 colony forming units/milliliter [cfu/ml] at 10⁻¹ dilution to 50 cfu/ml at 10⁻⁴ depending on organism, with control spacers yielding semiconfluent growth at these dilutions). Decontamination in Milton solution was also inadequate: confluent/semiconfluent growth at these dilutions. Decontamination in Mil-te in water and air-dried. (iii) Dishwasher at 60°C wash cycle, then air-dried. (iv) Steam sterilizer on standard cycle. (v) Autoclaved at 121°C/132°C. Spacers were then sampled for remaining test organism by standardized method, pipetted onto blood agar, incubated, and read.

Conclusion: This is the first study to successfully demonstrate decontamination methods to render spacers suitable for re-use in an ED. This has potential significant benefits for implementation of best practice and cost control in the evidence-based management of acute asthma in children.

211 The Clinical Utility of Virus Identification in Children Hospitalized With Bronchiolitis

Jonathan M Mansbach¹, Pedro A Piedra², Ashley F Sullivan³, Tate F Forgey³, Janice A Espinola³, and Carlos A Camargo Jr³

¹Children’s Hospital Boston, Boston, MA; ²Baylor College of Medicine, Houston, TX; ³Arnold Palmer Hospital, Orlando, FL; ⁴University of Pittsburgh, Pittsburgh, PA; ⁵Massachusetts General Hospital, Boston, MA

Background: The viral etiology of a severe bronchiolitis is of uncertain clinical relevance for inpatient care.

Objectives: To examine specific single or multiple viral infections affecting intensive care interventions in children hospitalized with bronchiolitis.

Methods: We performed a 16-center, prospective cohort study of hospitalized children age <2 years with a physician diagnosis of bronchiolitis. For three years from November 1 - March 31, beginning in 2007, researchers collected clinical data and nasopharyngeal aspirates. Intensive care unit (ICU) visits were oversampled. Polymerase chain reaction testing for 15 viruses and two bacteria is ongoing, but this analysis focuses on four viruses with complete testing: RSV-A, RSV-B, rhinovirus (RV), and hMPV. Analysis used proportions (95% confidence intervals [CI] and medians (inter-quartile ranges [IQR]), and was based on data as of 11/1/10.

Results: Of the 2,267 enrolled children, 377 (17%) were admitted to the ICU, and 160 were intubated or had continuous positive airway pressure (CPAP). The median age was four months and 60% were male; 62% were white, 25% black, and 36% Hispanic. To date, 8% (95% CI 6–9%) have no virus isolated, 66% (95% CI 64–68%) have single virus infections, and 26% (95% CI 24–28%) have multiple virus infections. Among those with one identified virus, the most commonly detected viruses were RSV-A (46%), RSV-B (32%), RV (27%), and hMPV (7%) (co-infections explain sum to >100%). At least one other virus was detected in 29% (95% CI 27–32%) of RSV-A infections, 30% (95% CI 26–33%) of RSV-B infections, 67% (95% CI 63–71%) of RV infections, and 44% (95% CI 36–52%) of hMPV infections. Length of hospital stay, ICU admission, and intubation/CPAP did not vary by presence or absence of each virus (all P > 0.01). Specific virus combinations may affect clinical outcomes and warrant further investigation.

Conclusion: This is the first study to successfully demonstrate decontamination methods to render spacers suitable for re-use in an ED. This has potential significant benefits for implementation of best practice and cost control in the evidence-based management of acute asthma in children.

212 Nasopharyngeal Aspirate Lactate Dehydrogenase Levels Predict Bronchiolitis Severity in a Prospective Multicenter Emergency Department Study

Jonathan M Mansbach¹, Pedro A Piedra², Federico Laham³, Alexander McAdam³, Sunday Clark³, Ashley F Sullivan³, and Carlos A Camargo Jr³

¹Children’s Hospital Boston, Boston, MA; ²Baylor College of Medicine, Houston, TX; ³Arnold Palmer Hospital, Orlando, FL; ⁴University of Pittsburgh, Pittsburgh, PA; ⁵Massachusetts General Hospital, Boston, MA

Background: An inverse linear relationship between increased levels of nasopharyngeal aspirate (NPA) lactate dehydrogenase (LDH), which is released from injured cells, and the severity of bronchiolitis was reported in early 2010 by Laham et al (Pediatrics 2010; 126:e225-e233). This finding, if confirmed, would represent an important advance for clinicians and researchers since objective indicators of bronchiolitis severity are lacking.

Objectives: We re-examined this potentially useful biochemical indicator of bronchiolitis severity in a multicenter emergency department (ED)-based cohort.

Methods: We conducted a 14-center prospective cohort study during 2005–2006 of ED patients age <2 years with bronchiolitis. The study was conducted in 10 states as part of the Emergency Medicine Network. Researchers collected nasopharyngeal aspirates, and conducted structured interviews, medical record reviews, and 2-week follow-up telephone calls. Samples were tested for LDH and for respiratory syncytial virus (RSV), rhinovirus (RV), human metapneumovirus (hMPV), and influenza viruses (Flu) using reverse transcription polymerase chain reaction.

Results: Testing of 277 samples revealed 176 (64%) were positive for RSV, 44 (16%) for RV, 26 (9%) for hMPV, 17 (6%) for Flu A, and none for Flu B. Concentrations of LDH in NPA samples were higher in children with RSV vs those without RSV (median [IQR], 7.8 [1.6–65.1] vs 4.1 [0.8–26.3], P = 0.05) and RV vs those without RV (14.4 [4.6–74.4] vs 5.2 [1.0–37.8], P = 0.03) but they were not statistically different from those with either hMPV or Flu A.
different for other measured viruses (all P > 0.10). In a multivari-
able analysis adjusting for age, placement of an IV, and lowest
oxygen saturation < 92%, NPA LDH concentration in the upper
two tertiles was associated with a reduced risk of hospitalization
for more than 24 hours (OR 0.34, 95% CI 0.15–0.78, P = 0.01 and
OR 0.54, 95% CI 0.24–1.19, P = 0.13).

Conclusion: Nasopharyngeal aspirate LDH levels in young chil-
dren with bronchiolitis varied according to viral etiology and dis-
ease severity. Values in the upper two tertiles were associated with
decreased risk of hospitalization, likely reflecting a robust antiviral
response. NPA LDH may be a useful biomarker to assist clinicians
with the decision of whether or not to hospitalize a child with
bronchiolitis.

213 Performance of a Rule to Predict Apnea in
Bronchiolitis
Paul Walsh, Sabrina Merchant, Valerie Aguilar,
Carolina Rodriguez, Rogello Molina, Jacquelyn
Heffner, Enrique Caldera, and Cynthia Garcia
Kern Medical Center, Bakersfield, CA

Background: One percent of children with bronchiolitis
develop apnea from which they fail to spontaneously auto-resusci-
tate. A rule to identify these has been created but not prospectively
validated. This rule categorizes infants as being at high risk for
apnea if (1) they are term and less than one month of age or (2) if preterm are less than 48 weeks post-conceptual age or (3) they have already had witnessed apnea.

Objectives: To validate this rule.

Methods: Patients were drawn from prospective studies of
apnea and bronchiolitis. Patients from the apnea study were
included if they had bronchiolitis. Patients from the bronchiolitis
study were included if they were less than six months of age.
These cohorts were followed through their hospital stay to deter-
mine if they developed apnea. If discharged from the emergency
department (ED), they had telephone follow-up after three days.
We measured the sensitivity and specificity of the rule to predict
subsequent apnea. Based on the results, we propose a modified
version of the original rule. Data entry was performed using a cus-
tomized database and statistical analysis using Stata 11 (Statacorp
version 11).

Results: Twenty-four eligible infants presented with apnea and
had bronchiolitis. Five hundred and twenty-three infants were less
than six months old and presented with bronchiolitis. Five of these
developed apnea. In total, nine infants had apnea following admission.
No one who was discharged died or developed apnea within
three days of their ED visit. This rule missed 1/9 (11%) infants who
subsequently developed apnea and 1/5 (20%) who developed new-
sborn apnea. The rule had a sensitivity of 88.9% (95% CI 51.8%,
99.7%) and a specificity of 76.2% (95% CI 72.4%, 79.6%) in the for-
ter category. Modifying the rule to admit term infants less than
six weeks of age would have resulted in no misses in either cate-
gory (sensitivity 100%, 95% CI 66.4%–100%, and specificity 65.4%,
95% CI 61.3%, 69.4%). Applying this rather than the original rule
would have increased the number of admissions in our center by
95% CI 61.3%–69.4%). Applying this rather than the original rule
would have increased the number of admissions in our center by
one percent. Modifying the rule to classify term infants as being at high-risk for apnea if less than six weeks of age increased the rule’s safety.

214 Canadian Heart Failure Risk Scale to
Identify Emergency Department Patients
With Heart Failure at High Risk for Serious
Adverse Events
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Shawn Aaron6, Eddy Lang7, Lisa A. Calder6,
Jeffrey J. Perry8, Alan Forster9, and George A. Wells7
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Canada; 4University of Alberta, Edmonton, AB,
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Canada; 6University of Ottawa, Ottawa, ON,
Canada; 7University of Calgary, Calgary, AB,
Canada

Background: There are no validated decision tools to assist
physicians with difficult hospital admission decisions for emer-
gency department (ED) patients with heart failure (HF).

Objectives: To develop a risk scoring system to identify HF
patients at high risk for serious adverse events (SAEs).

Methods: We conducted a prospective cohort study in six large EDs and enrolled adult patients who presented with dyspnea sec-
ondary to HF. Each patient was assessed for standardized clinical
and laboratory variables including the novel 3-minute walk test and quantitative NT-ProBNP. Patients, both those admitted and
discharged, were followed for SAE which was defined as death,
intubation, admission to a monitored unit, or relapse back to the
ED requiring admission within 14 days. We calculated adjusted
odds ratios for predictors of SAE by stepwise logistic regression and
then developed a scoring system by rounding coefficients.

Results: We enrolled 559 patients with a mean age of 76.0 years
and overall hospital admission rate of 38.1%. Of 65 (11.6%) SAE cases, 31 (47.7%) occurred in patients not admitted on the initial
ED visit. The multivariate model and resultant Canadian Heart
Failure Risk Scale (see the Figure) consists of 10 elements and SAE
risk varied from 2.8% for a score of 0, to 89.0% for a score of 9,
with good calibration between observed and expected probabil-
ities. Internal validation showed the risk scores to be very accurate
across 1,000 replications using the bootstrap method. Choosing a
threshold of 1, 2, or 3 total scores for admission would be associ-
ated with sensitivities of 95.2%, 80.6%, or 64.5%, respectively, all
better than current practice.

Conclusion: While some HF patients seen in the ED suffer sub-
sequent SAEs or death, the majority have good outcomes even if

Canadian Heart Failure Risk Scale

<table>
<thead>
<tr>
<th>Items</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Stroke or TIA</td>
<td>1</td>
</tr>
<tr>
<td>b) Intubation for respiratory distress</td>
<td>2</td>
</tr>
<tr>
<td>c) Heart rate on ED arrival ≥ 110</td>
<td>2</td>
</tr>
<tr>
<td>d) S &amp; O2 &lt; 90% on arrival</td>
<td>1</td>
</tr>
<tr>
<td>e) Heart rate ≥ 110 during 3-minute walk test</td>
<td>1</td>
</tr>
<tr>
<td>3. Investigations</td>
<td></td>
</tr>
<tr>
<td>a) ECG has acute ischemic changes</td>
<td>2</td>
</tr>
<tr>
<td>b) Urea ≥ 12 mmol/L</td>
<td>1</td>
</tr>
<tr>
<td>c) Serum CO2 ≥ 55 mmol/L</td>
<td>2</td>
</tr>
<tr>
<td>d) Troponin I or T elevated to MI level</td>
<td>2</td>
</tr>
<tr>
<td>e) BNP ≥ 5,000 ng/L (NT-ProBNP)</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Score (0–10):

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2.8%</td>
</tr>
<tr>
<td>Medium</td>
<td>5.1%</td>
</tr>
<tr>
<td>High</td>
<td>9.2%</td>
</tr>
<tr>
<td>Very High</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>15.9%</td>
</tr>
<tr>
<td>5</td>
<td>16.4%</td>
</tr>
<tr>
<td>6</td>
<td>20.1%</td>
</tr>
<tr>
<td>7</td>
<td>45.8%</td>
</tr>
<tr>
<td>8</td>
<td>68.9%</td>
</tr>
<tr>
<td>9</td>
<td>81.2%</td>
</tr>
<tr>
<td>10</td>
<td>89.6%</td>
</tr>
</tbody>
</table>

Figure 1: Canadian Heart Failure Risk Scale to Identify ED Patients with Heart Failure at High Risk for Serious Adverse Events

Heart Failure Risk Categories for Serious Adverse Events
initially discharged. We have developed an accurate and easy to use Canadian Heart Failure Risk Scale that can be used to stratify the risk of poor outcomes for these patients and to enable rational and safe hospital admission decisions.

215 Galectin 3 Levels Correlate With Increased Creatinine, BNP, and Adverse 30 Day Event Rates in Patients With Acute Decompensated Heart Failure

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1University of Cincinnati, Cincinnati, OH; 2Vanderbilt University, Nashville, TN; 3University of Maryland, Baltimore, MD

Background: Galectin 3 (G3), a protein produced by activated macrophages, is a mediator of fibrosis and remodeling in the failing heart. Studies have shown that elevated G3 concentrations are associated with ventricular dysfunction and increased 4-year cardiovascular mortality. Whether G3 has the potential to facilitate decision-making in acute heart failure syndromes (AHFS) has not been evaluated.

Objectives: We hypothesized that in emergency department (ED) patients with AHFS, increased G3 levels would be associated with other markers of severity such as BNP and abnormal renal function, and with 5 and 30-day AHFS-related events.

Methods: Patients diagnosed with and treated for AHFS in the ED were prospectively enrolled in this IRB-approved study. Demographic, clinical, and lab data were obtained at the time of the visit. Five and 30-day events (unscheduled ED visits or hospitalizations for AHFS and all-cause mortality) were obtained by phone follow-up. G3 levels were measured in banked blood using BGM Galectin 3 ELISA. The Mann-Whitney U test and Spearman’s correlation were analyzed using SAS software (v 9.2) with significance set at 0.05.

Results: A total of 100 patients (51 female and 49 male) were included, 89% of whom were African American (mean age [SD]: 57.5 [13.2] yrs). Few (16%) were fully or partially employed, nearly a third (31%) lacked a high-school education, and 55.6% reported any 5-day HF event. BNP was 731.0 pg/ml (9.0–4850.0 pg/ml) and BUN was 17.0 mg/dl (17 v 35 mg/dl) (see the Table). Median G3 values were similar between 75th and 3rd percentiles (28 v 14.6 %, p=0.032).

Conclusion: Elevated G3 is associated with markers of AHFS severity and with 30-day events. Further study to explore the prognostic utility of G3 and its role in decision-making in the ED patient with AHFS is warranted.

216 Health Literacy and Its Impact on Illness Beliefs for Emergency Department Patients With Acute Heart Failure

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Background: Maintenance of well-being for patients with heart failure (HF) is highly dependent on appropriate self-care behaviors and underlying illness beliefs. Health literacy (HL) is a potential modifier of this interaction but the nature of the relationship in patients with acute HF is not known.

Objectives: To evaluate HL and its relationship with illness beliefs in a cohort of emergency department (ED) patients with acute HF.

Methods: A convenience sample was prospectively enrolled. Demographic, education, and social support data were obtained along with self-reported responses to the 36-item Short Test of Functional Health Literacy in Adults (STOFHLA) and a validated, 14-item HF illness belief questionnaire from a convenience sample of acute HF patients. HL was categorized as inadequate if the STOFHLA score was 16–19, marginal if it was 17–22, and adequate with scores of 23–36. Illness belief accuracy was determined using the Common Sense Model of Illness where a score < 3 (on a 4-point Likert scale) = inaccurate beliefs. General association between HL and categorical factors was assessed using the chi-square or Fisher’s exact test, and comparisons with illness beliefs were made using the Kruskal-Wallis test.

Results: A total of 100 patients (51 female and 49 male) were included, 89% of whom were African American (mean age [SD]: 57.5 [13.2] yrs). Few (16%) were fully or partially employed, nearly a third (31%) lacked a high-school education, and 55.6% reported

<table>
<thead>
<tr>
<th>Age</th>
<th>≤ 75th %tile</th>
<th>&gt; 75th %tile</th>
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<tbody>
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<td>≤ 75th %tile</td>
<td>&gt; 75th %tile</td>
<td>P value</td>
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</tr>
<tr>
<td>Age</td>
<td>66</td>
<td>27–99</td>
<td>67</td>
</tr>
<tr>
<td>Race</td>
<td>Caucasian</td>
<td>92</td>
<td>60.9%</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>59</td>
<td>39.1%</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>88</td>
<td>58.3%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>63</td>
<td>41.7%</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>No</td>
<td>40</td>
<td>26.5%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>111</td>
<td>73.5%</td>
</tr>
<tr>
<td>Renal Disease</td>
<td>No</td>
<td>124</td>
<td>82.1%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>27</td>
<td>17.9%</td>
</tr>
<tr>
<td>Heart rate</td>
<td>85</td>
<td>49–165</td>
<td>86</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>20</td>
<td>12–30</td>
<td>20</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>147</td>
<td>89–262</td>
<td>139</td>
</tr>
<tr>
<td>BNP</td>
<td>731.0</td>
<td>9.0–4850.0</td>
<td>1190.5</td>
</tr>
<tr>
<td>Sodium</td>
<td>139.0</td>
<td>100–146.0</td>
<td>138.0</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.2</td>
<td>0.5–6.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Any 5 day HF event</td>
<td>Yes</td>
<td>3</td>
<td>2.00%</td>
</tr>
<tr>
<td>Any 30 day HF event</td>
<td>Yes</td>
<td>22</td>
<td>14.60%</td>
</tr>
</tbody>
</table>
insufficient income to “make ends meet”. Inadequate, marginal, and adequate HL were present in 35%, 17%, and 48%, respectively, with increasing adequacy among those with higher levels of education (p<0.001). While overall HF illness beliefs were considered “inaccurate” (mean score [SD] = 2.8 [0.3]), a positive correlation was noted between HL and illness belief mean score (r = 0.26; p = 0.008), the belief that HF is a threat to health (r = 0.29; p = 0.004), and the belief that an HF plan of care must be followed forever (r = 0.37; p < 0.001).

Conclusion: In this cohort of predominantly African American ED patients with acute HF, increasing HL is positively correlated with the accuracy of HF illness beliefs.

217 Mid-region Prohormone Adrenomedullin Identifies Acutely Dyspneic Emergency Department Patients With High 90 Day Mortality: Results From the Biomarkers in Acute Heart Failure Trial

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Background: Adrenomedullin (ADM) is a vasodilatory peptide with potent hypotensive effects and is expressed in many tissues. Recently published results from the BACH (Biomarkers in Acute Heart Failure) Trial have shown that mid-region pro-adrenomedullin (MR-proADM), a stable precursor of ADM, has superior accuracy for predicting 90 day mortality when compared to BNP (73% vs. 62%, respectively, p < 0.001) in emergency department (ED) patients with AHF.

Objectives: This analysis was computed to determine the prognostic ability of MR-proADM in all ED patients enrolled in the study, irrespective of the final diagnosis.

Methods: The BACH trial was a prospective, 15-center, multinational study of 1641 patients presenting to the ED with a primary complaint of acute dyspnea. The study was approved by the IRBs of all participating centers. This data set was analyzed to determine the prognostic accuracy of the initial ED MR-proADM measurement for predicting 90 day mortality in all enrolled patients with acute dyspnea. Plasma specimens were stored at −70°C and MR-proADM levels were measured in a central lab.

Results: Of the 1641 enrolled patients, 34.6% were adjudicated to have AHF, 12.2% COPD, 7.0% asthma, 6.8% pneumonia, 6.5% chest pain of unknown etiology, 3.7% bronchitis, 3.4% arrhythmia, 2.4% ACS, 2.3% pulmonary embolism, 1.6% influenza, and 18.5% with an alternate final diagnosis. Compared to BNP or troponin, MR-proADM was superior for predicting 90 day all-cause mortality in this entire patient population (p = 3.28) and was superior to all other biomarkers measured in predicting mortality at 90 days. MR-proADM added significantly to the best clinical model (p < 0.0001, bootstrap corrected c index increased from 0.775 to 0.807, adjusted standardized HR 2.59 [1.91–3.50]). Within the model, MR-proADM was the largest contributor to the predictive performance, with a net reclassification improvement of 0.9%.

Conclusion: MR-proADM identifies acutely dyspneic ED patients with high 90 day mortality and adds prognostic value to the natriuretic peptides irrespective of the final diagnosis. The use of a prognostic biomarker that is not particular to a single disease but is symptom-specific may improve the risk stratification of these patients and thus alter their ED management.

218 Diagnostic and Prognostic Value of Uric Acid With BNP in Acute Heart Failure Syndromes

Queen Henry-Okafor1, Sean P. Collins2, Cathy A. Jenkins3, Karen F. Miller1, David J. Maron1, Allen J. Naftilan1, Santosh Menon1, John McPherson1, Gregory J. Hermann2, Neal Weintraub2, Douglas B. Sawyer1, and Alan B. Sororow1

1Vanderbilt University Medical Center, Nashville, TN; 2The University of Cincinnati, Cincinnati, OH; 3Vanderbilt University School of Medicine, Nashville, TN; 4The Christ Hospital, Cincinnati, OH

Background: B-type (brain) natriuretic peptide (BNP) is an accepted diagnostic and prognostic marker of heart failure. However, its utility is limited in the indeterminate range of 100–500 pg/ml. Uric acid has also been suggested to have diagnostic and prognostic utilities in acute heart failure syndromes (AHFS).

Objectives: We therefore investigated whether the combination of uric acid with BNP aids in the diagnosis and prognosis of patients evaluated for AHFS in the emergency department (ED).

Methods: STRATIFY, an ongoing three-center study, used a cohort of 266 adult ED patients who presented with symptoms of AHFS. Demographic, clinical, and laboratory data were collected from subjects who met modified Framingham criteria for AHFS. The primary endpoints were AHFS diagnosis as determined by a panel of cardiologists blinded to uric acid levels, and 5- and 30-day adverse outcomes consisting of one of the following: prolonged hospitalization, death, major cardiac events, and ED/hospital recidivism (all-cause and AHFS only). Likelihood ratios (LRs) were used to assess whether uric acid improves upon BNP in predicting outcomes across all BNP levels including the indeterminate range. Areas under the curve (AUCs) were calculated for the BNP models with (full model) and without (reduced model) uric acid against the diagnostic outcome (p=0.0001, and p=0.0001, respectively).

Results: The median BNP was 352 pg/ml (IQR=100, 959) and the median uric acid was 7.3 mg/dl (IQR=5.8, 8.8). LRs showed that uric acid improved upon BNP (across all BNP levels and when restricted to the indeterminate range) in explaining the variability in the diagnostic outcome (p=0.0001, and p=0.0001, respectively). However, the AUC for the full and reduced models achieved significance only when BNP was restricted to the indeterminate range (p=0.27 versus p=0.03 for all BNP levels versus BNP restricted to 100–500 pg/ml, respectively).

Conclusion: Assessing uric acid levels in ED patients with suspected AHFS may add diagnostic information in the subset of patients with indeterminate BNP levels in the 100–500 pg/ml range.
Health Care Resource Utilization Among Patients With Acute Decompensated Heart Failure Triaged to an Emergency Department Observational Unit

Emory University School of Medicine, Atlanta, GA

Background: Data on the effectiveness of observational unit (OU) management of acute decompensated heart failure (ADHF) are limited.

Objectives: To determine the mortality, readmission, and resource utilization of patients with acutely decompensated heart failure (ADHF) managed by protocol in an emergency department (ED) OU.

Methods: A cohort study of 174 ADHF patients admitted to two urban teaching hospital-affiliated OUs between 7/2007 and 12/2009. Criteria for OU triage included history of HF, systolic blood pressure (SBP) >100 mmHg, heart rate <130/min, respiratory rate <32/min, O2 >90% after initial treatment, and no acute comorbidities. Patients were managed by protocol and enrolled in an OU database. Descriptive statistics included subsequent mortality, recidivism (readmission or repeat ED visit), or resource utilization (all hospital bed days) at 30, 90, 180 days following the index visits. Differences between groups were reported using p-values (sig is <0.05). Differences in median hospital days were calculated using IQR and p-values calculated with the nonparametric Mann-Whitney test since the distribution of variables was skewed.

Results: There were 174 patients enrolled: age 61 ±15.5 years, 52% male, 73.6% black, ejection fraction was 32.3 ±18.5%, HF was ischemic in 37.9%. Most patients were on optimal outpatient medical therapy. Average time from ED presentation to OU triage was 5.4 ±2.0 h; average OU stay was 16.3 ±6.6 h. On presentation, SBP was 145 ±32 mmHg, BUN was 21.6 ±14.0 mg/ml, creatinine was 1.5 ±1.45 mg/ml, and BNP was 891 ng/ml (interquartile range 359 to 1837). Subsequently, 62/174 (35.6%) were hospitalized from the OU. Subsequent mortality, recidivism, and health care resource utilization was not significantly different between patients eventually admitted to hospital and those discharged from OU (see the Table).

Conclusion: In this study, OU management of ADHF resulted in similar mortality, re-admission, and resource utilization regardless of disposition from the ED OU. These rates are similar to those reported after hospitalization.

Soluble ST2 as a Diagnostic and Prognostic Marker for Acute Heart Failure Syndromes

Queen Henry-Okafor1, Sean P. Collins2, Cathy A. Jenkins3, Karen F. Miller1, David J. Maron3, Allen J. Naftulan1, John McPherson1, Neal Weintraub2, Gregory J. Ferrmann2, Santosh Menon4, Patricia Fick1, Douglas B. Sawyer1, and Alan B. Storrow1

1Vanderbilt University Medical Center, Nashville, TN; 2The University of Cincinnati, Cincinnati, OH; 3Vanderbilt University School of Medicine, Nashville, TN; 4The Christ Hospital, Cincinnati, OH

Background: The soluble receptor form of ST2 (sST2), a member of the interleukin-1 receptor family, has emerged as a biomarker for acute heart failure syndromes (AHFS).

Objectives: This study investigated the association of sST2 with diagnostic and prognostic outcomes and assessed whether it adds incrementally to brain natriuretic peptide (BNP) in predicting outcomes in emergency department (ED) patients with suspected AHFS.

Methods: Adult patients who presented to three tertiary hospital EDs with symptoms of AHFS and met modified Framingham criteria were prospectively recruited. Measured outcomes included diagnosis of AHFS as determined by a panel of cardiologists blinded to sST2 levels, and occurrence of any one of the following at 5- and 30-day mortality, 90-day mortality, 180-day mortality, 30-day mortality or readmission, 90-day mortality or readmission, 180-day mortality or readmission, 30-day mortality or readmission or ED visit, 90-day mortality or readmission or ED visit, 180-day mortality or readmission or ED visit, 30-day days-in-hospital, 90-day days-in-hospital, 180-day days-in-hospital, and 30-day mortality or readmission or ED visit, 90-day mortality or readmission or ED visit, 180-day mortality or readmission or ED visit.

Outcome measures

<table>
<thead>
<tr>
<th>Outcome</th>
<th>All (n=174)</th>
<th>Admitted after OU stay (n=62)</th>
<th>Discharged after OU stay (n=112)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-day mortality</td>
<td>0 (0.0%)</td>
<td>1 (1.6%)</td>
<td>2 (1.8%)</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>90-day mortality</td>
<td>3 (1.7%)</td>
<td>2 (3.2%)</td>
<td>9 (8.0%)</td>
<td>0.33</td>
</tr>
<tr>
<td>180-day mortality</td>
<td>11 (6.3%)</td>
<td>2 (3.2%)</td>
<td>9 (8.0%)</td>
<td>0.069</td>
</tr>
<tr>
<td>30-day mortality or readmission</td>
<td>33 (17.2%)</td>
<td>26 (23.2%)</td>
<td>2 (1.8%)</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>90-day mortality or readmission</td>
<td>61 (46.6%)</td>
<td>52 (44.6%)</td>
<td>9 (8.0%)</td>
<td>0.74</td>
</tr>
<tr>
<td>180-day mortality or readmission</td>
<td>108 (62.1%)</td>
<td>68 (60.7%)</td>
<td>40 (44.6%)</td>
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<tr>
<td>30-day mortality or readmission or ED visit</td>
<td>49 (28.2%)</td>
<td>36 (32.1%)</td>
<td>13 (21.0%)</td>
<td>&gt;0.99</td>
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<tr>
<td>90-day mortality or readmission or ED visit</td>
<td>98 (56.3%)</td>
<td>63 (56.2%)</td>
<td>35 (56.4%)</td>
<td>0.86</td>
</tr>
<tr>
<td>180-day mortality or readmission or ED visit</td>
<td>126 (72.4%)</td>
<td>82 (73.2%)</td>
<td>44 (71.0%)</td>
<td>&gt;0.99</td>
</tr>
</tbody>
</table>

In-hospital outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>All (n=174)</th>
<th>Admitted after OU stay (n=62)</th>
<th>Discharged after OU stay (n=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-day days-in-hospital (mean±SD)</td>
<td>0.9±2.6</td>
<td>0.8±2.1</td>
<td>0.9±2.4</td>
</tr>
<tr>
<td>90-day days-in-hospital (mean±SD)</td>
<td>3.1±6.5</td>
<td>3.0±7.2</td>
<td>3.1±6.0</td>
</tr>
<tr>
<td>180-day days-in-hospital (mean±SD)</td>
<td>5.0±8.2</td>
<td>5.5±8.7</td>
<td>4.7±8.0</td>
</tr>
</tbody>
</table>
Correlation Between Internal Jugular Vein Dimensions and Congestive Heart Failure

Catherine A Gogela Carlson, Michael Zwank, and Christopher Anderson
Regions Hospital, St Paul Park, MN

Background: Exacerbation of congestive heart failure (eCHF) is a common cause of dyspnea in patients presenting to the emergency department (ED). eCHF is often challenging to diagnose in the ED setting and a bedside adjunct would be a useful diagnostic tool. Historically, eCHF has been purported to cause jugular venous distension on physical exam.

Objectives: We sought to determine if bedside ultrasound could detect a difference in the size and collapsibility of the internal jugular vein (IJV) of patients with eCHF versus healthy controls.

Methods: In a case-control trial using bedside ultrasound, we examined the IJVs of 26 healthy volunteers and 20 ED patients with confirmed eCHF. We imaged the veins with individuals lying flat as well as at a bed incline of 45 and 60 degrees. IJV area ratios (IJARs) were calculated by dividing the IJ area measured at 60 degrees by the IJ area at 0 degrees.

Results: This study included 495 subjects. Unadjusted analyses indicated sST2 was associated with the diagnostic outcome (p = 0.02), but this did not hold in the adjusted analysis (OR = 1.21, 95% CI = 0.83, 1.76; p = 0.33). After adjusting for confounders, the AUC of sST2 was 0.62 (95% CI = 0.56, 0.69). An association of sST2 with 30-day readmission due to AHFS was noted in the unadjusted analysis (p = 0.04) but not in the adjusted analysis (OR = 1.13, 95% CI = 0.76, 1.67; p = 0.55). LR tests failed to show that sST2 adds significant information to BNP in the diagnostic and prognostic outcomes. AUCs for the full and reduced diagnostic models were both 0.76 (95% CI = 0.71, 0.83; p = 0.84).

Conclusion: Among ED patients with suspected AHFS, sST2 provided weak diagnostic and prognostic information that did not add to BNP utility. Thus, sST2 is unlikely to improve management of ED patients with AHFS.

Clinical Outcomes and Literacy and Numeracy in ED Patients With Suspected Heart Failure

Candace McNaughton1, Sean Collins2, Cathy Jenkins3, Sunil Kripalani3, Phillip Levy4, Karen Miller3, Allen Naftilan3, Russell Rothman3, and Alan Storrow3
1VA Tennessee Valley Healthcare System and Vanderbilt University, Nashville, TN; 2University of Cincinnati, Cincinnati, OH; 3Vanderbilt University, Nashville, TN; 4Wayne State University, Detroit, MI

Background: Patients with lower health literacy and numeracy are known to have worse clinical outcomes, but little research has focused on emergency department (ED) patients.

Objectives: To determine whether low health literacy or numeracy are associated with adverse events in ED patients who present with signs and symptoms concerning for an acute exacerbation of heart failure.

Methods: We conducted a multi-center prospective cohort study using a convenience sample of ED patients with a clinical presentation concerning for acute heart failure. Literacy was measured using the 3-Item Health Literacy Screening Questions; numeracy was measured using the Subjective Numeracy Scale. The composite outcome was prolonged hospitalization if admitted, repeat ED visits or hospitalization within 30 days, or death within 30 days. Logistic regression was used to assess the association between measures of literacy or numeracy and the primary composite outcome, with adjustment for age, race, sex, prior ED visits for heart failure within six months, and automatic implantable cardioverter-defibrillator (AICD) placement.

Results: A total of 495 patients were included. Demographics are found in Table 1. Literacy scores were highly skewed, with a median score of 13 (IQR 9, 15) on a 15-point scale. The median numeracy score was 30 (IQR 22, 38) on a 48-point scale. Crude and adjusted analyses of the data did not detect a difference in the composite outcome based on literacy (adjusted OR = 1.17, 95% CI 0.78 to 1.75; p = 0.44) or numeracy (adjusted OR = 0.99, 95% CI 0.97 to 1.00; p = 0.13).

Conclusion: In this cohort of ED patients with suspected heart failure, we were unable to show an association between health lit-
eracy or numeracy and adverse clinical outcomes. Patients in this cohort had unexpectedly high health numeracy and literacy levels, making it more difficult to detect a difference in clinical outcomes based on these measures. It is also possible that health literacy may not affect acute events to the degree it does longer term events. Future work is needed to better evaluate the role of health literacy and numeracy for patients with possible heart failure in the ED setting.

**Table 1: Demographics, n=495**

<table>
<thead>
<tr>
<th>Age</th>
<th>62 (IQR 52, 73)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53% (260)</td>
</tr>
<tr>
<td>Female</td>
<td>47% (235)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>57% (282)</td>
</tr>
<tr>
<td>Non-white</td>
<td>43% (213)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>&gt;High school</td>
<td>31% (151)</td>
</tr>
<tr>
<td>= High school</td>
<td>69% (343)</td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Insured</td>
<td>89% (449)</td>
</tr>
<tr>
<td>Uninsured</td>
<td>11% (52)</td>
</tr>
<tr>
<td>s/p AICD</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>83% (409)</td>
</tr>
<tr>
<td>Yes</td>
<td>17% (84)</td>
</tr>
<tr>
<td>ED visits for heart failure in prior 6 months</td>
<td>No</td>
</tr>
</tbody>
</table>


Brent Passarelo, Zach Levy, Thomas Damiano, Brian Levine, Ellen Finney, James Reed III, and Neil Jasani

Christiana Care Health System, Newark, DE

**Background:** “Super users” pose many challenges to emergency department (ED) staff, including the management of complex medical and behavioral issues, as well as the overutilization of finite resources. Pain management is often a focus in a subset of this population. In our two-hospital system (160,000 annual ED visits), a pain protocol was implemented to examine the effect on ED usage in this group. In a previous study, six-month post-protocol data indicated a statistically significant reduction in total ED visits (\( p = 0.001 \)), a sizable but non-significant reduction in inpatient days (\( p = 0.07 \)), and an annualized reduction in total charges estimated at $433,944.

**Objectives:** To determine the long-term effect of pain protocol implementation on super user ED visits, total charges, and inpatient days beyond the 6-month period previously reported.

**Methods:** Emergency department visits, inpatient days, and total charges were reviewed for the 14 patients identified in the original study. Eighteen months of pre-protocol data were compared to the initial 6 months and subsequent 23 months of post-protocol data. Analysis was completed using one-way ANOVA followed by the Student-Newman-Kuels post-hoc procedure (SNK) where appropriate. A \( p \)-value of \( \leq 0.05 \) was considered significant.

**Results:** A total of 418 responses (28%) were returned over a period of three months. The average years in practice (including residents) were 13. Almost all physicians identified that they care for FEDUs (97%). Ninety-one percent of physicians considered FEDUs to be “problems” for EDs. Only 18% of residents felt they had the same empathy for FEDUs as for other patients, and 79% recognized they felt some bias toward FEDUs. When asked if they feel burnout when working with FEDUs (emotional exhaustion, depersonalization, decreased feeling of personal accomplishment) 17% felt no burnout, 23% endorsed one symptom, 25% endorsed two symptoms, and 34% endorsed all three symptoms. However, years in practice were not associated with burnout. Increased burnout (two or more symptoms endorsed) significantly increased physicians’ perceptions of the amount of time and effort spent with FEDUs (\( p=0.01 \)). In addition, increased burnout decreased feelings of empathy for the FEDU population and increased perceptions that FEDUs are “problems” for EDs (\( p<0.01 \)).

**Conclusion:** Emergency department physicians recognize working with FEDUs affects their ability to be non-judgmental and fosters feelings of burnout. ED physician burnout leads to a variety of negative perceptions about FEDUs. This experience of burnout does not appear to be related to the years of experience of the ED physician, and thus, all ED physicians are at risk for these cynical reactions. Recommendations include devising novel ways to assist ED physicians who experience the negative emotional reactions FEDUs elicit.

<table>
<thead>
<tr>
<th>Months Post</th>
<th>Pre Protocol</th>
<th>Post Protocol</th>
<th>Pre Vs. 6 Months Post</th>
<th>Pre Vs. 6 Months Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 Months</td>
<td>4.6 ± 2.8</td>
<td>2.9 ± 2.2</td>
<td>p=0.001</td>
<td>p=0.001</td>
</tr>
<tr>
<td>In-Patient Days</td>
<td>5.8 ± 4.3</td>
<td>4.0 ± 4.2</td>
<td>p=0.07</td>
<td>p=0.20</td>
</tr>
<tr>
<td>Average Total Charges</td>
<td>$6469</td>
<td>$3886</td>
<td>$7686</td>
<td>$7686</td>
</tr>
</tbody>
</table>

**Background:** Frequent emergency department user (FEDU) literature has predominantly focused on innovative ways to provide FEDU care. Several studies have suggested FEDUs are a source of burnout and frustration for emergency department (ED) physicians, though no specific study has directly surveyed ED physicians for their opinions regarding FEDUs.

**Objectives:** To describe ED physicians’ opinions about their work with FEDUs.

**Methods:** An IRB-approved, 18-question, anonymous survey was sent to a random sample of 1000 American College of Emergency Physicians (ACEP) members and a convenience sample of 491 current residents, staff, and alumni from the authors’ institution. The surveys were multiple choice, with availability to write in comments for additional clarification. Data were analyzed using the chi-square test.

**Results:** A total of 418 responses (28%) were returned over a period of three months. The average years in practice (including residents) were 13. Almost all physicians identified that they care for FEDUs (97%). Ninety-one percent of physicians considered FEDUs to be “problems” for EDs. Only 18% of residents felt they had the same empathy for FEDUs as for other patients, and 79% recognized they felt some bias toward FEDUs. When asked if they feel burnout when working with FEDUs (emotional exhaustion, depersonalization, decreased feeling of personal accomplishment) 17% felt no burnout, 23% endorsed one symptom, 25% endorsed two symptoms, and 34% endorsed all three symptoms. However, years in practice were not associated with burnout. Increased burnout (two or more symptoms endorsed) significantly increased physicians’ perceptions of the amount of time and effort spent with FEDUs (\( p=0.01 \)). In addition, increased burnout decreased feelings of empathy for the FEDU population and increased perceptions that FEDUs are “problems” for EDs (\( p<0.01 \)).

**Conclusion:** Emergency department physicians recognize working with FEDUs affects their ability to be non-judgmental and fosters feelings of burnout. ED physician burnout leads to a variety of negative perceptions about FEDUs. This experience of burnout does not appear to be related to the years of experience of the ED physician, and thus, all ED physicians are at risk for these cynical reactions. Recommendations include devising novel ways to assist ED physicians who experience the negative emotional reactions FEDUs elicit.
Background: Deep venous thrombosis (DVT) is a common, lethal problem requiring timely and safe anticoagulation. Emergency department (ED) providers are reluctant to discharge DVT patients given risks of DVT, treatment, and follow-up concerns. Background research at our hospital identified 106 medical DVT-only ED patients over 17 months, with 41% admitted and 30-day ED return of 16% with higher rates in uninsured patients (25%).

Objectives: We hypothesized that development of an ED DVT clinical care pathway providing system-wide education and timely follow-up would decrease admissions for acute ED DVT patients and decrease 30-day ED revisits.

Methods: We developed and implemented a multi-disciplinary DVT clinical care pathway in the ED to ensure timely, safe, and effective anticoagulation with follow-up for patients regardless of payer status. A standardized electronic order set outlined inclusion criteria, laboratory orders (per Joint Commission National Patient Safety Goal recommendations), medications, and prescriptions, and provided detailed discharge instructions, including anticoagulation clinic follow-up. We educated providers on patient risk-stratification and how to safely, effectively bridge patients. We educated patients and families about DVT and called them in 48-hours. Two independent, trained abstractors collected data from ED medical records on DVT admission rates, 30 day ED revisits, and laboratory ordering practices for the 3 months before, and after, rollout of the pathway. Pulmonary embolism (PE) patients were tracked as a surrogate marker for baseline changes in ED volume. This work was IRB-approved.

Results: Pilot data from the ED comparing the 3 months before to the 3 months after the implementation of the DVT pathway show: None of the PE patients were the same as the DVT patients. Provider compliance with laboratory ordering decreased with use of the pathway.

Conclusion: Pilot data from the development and implementation of a multi-disciplinary ED DVT clinical care pathway and educational program at our hospital demonstrate potential success in improving care for a diverse ED patient population with acute DVT by decreasing admissions and 30 day ED revisits without increasing DVT risk. Larger studies are needed for generalizability.


Zachary F Meisel and Matthew J. Press

1University of Pennsylvania, Philadelphia, PA; 2Cornell University, New York, NY

Background: Hospitals are increasingly required to measure, report, and reduce readmissions. Admission decisions are often made in the emergency department (ED), yet little is known about ED disposition decisions for patients who return after a recent hospitalization.

Objectives: 1) To describe trends in admission rates for ED patients recently hospitalized in the United States between 2004 and 2008. 2) To describe the associations between recent hospitalization and ED disposition after adjustment for patient and hospital characteristics.

Methods: Analysis of the National Hospital Ambulatory Medical Care Survey, a national survey of ED visits, from 2005–2008 was conducted. Patients over 18 were included. Patients who left against medical advice, who died in the ED, or who were transferred were excluded. The primary outcome was admission to the hospital or to observation. The primary independent variable was any hospitalization within the previous 7 days. Predictors included patient, hospital, and temporal factors. Analysis accounted for complex sample design and used weighted least squares and multi-variable logistic regression.

Results: 2.4% of total ED visits (estimated 2.3 million/yr) were from recently hospitalized patients. Admission rates for recently hospitalized patients increased for each year of the study, from 28.6% to 38.0%. Admission rates for visits from patients not recently hospitalized increased at a lesser rate, from 15.3% to 17.2%. After adjustment, the odds ratio of admission for patients recently hospitalized vs. not were OR 2.35 (95% CI 1.7–3.2, p<0.001 in 2005–2006); OR 2.50 (95% CI 2.1–3.0, p<0.001 in 2007–2008). Older age and higher triage acuity were associated with increased odds of admission but did not confound or modify the effect between recent hospitalization and admission for any year.

Conclusion: Patients who return to the emergency department within 7 days of hospitalization have both relatively high and increasing rates of readmission. These findings do not appear to be driven by differences in age or triage acuity. Policies and programs aimed at reducing hospital readmissions should consider the role of the ED in determining the disposition of recently hospitalized patients. Hospitals might identify strategies to both reduce ED use among discharged patients as well as improve the capacity for their EDs to safely discharge them.
Background: In recent years, Medicare and other insurance payers have increasingly scrutinized hospital admissions and lengths of stay.

Objectives: We hypothesized that this has resulted in an increase in emergency department (ED) return visits and subsequent admissions through the ED for geriatric patients (age 65 and older), within 72 hours of a prior ED discharge.

Methods: Design: retrospective cohort of ED visits. Setting: 35 suburban, urban, and rural New York and New Jersey EDs with annual visits from 14,000 to 82,000. Population: consecutive patients aged 65 and older seen by ED physicians between 1/1/1996 and 9/30/2010. Protocol: for each year, we counted the number of patients > 65 years and the number of unscheduled returns to the ED and subsequent admissions to the hospital through the ED within 72 hours of a prior ED discharge. Data analysis: for each year, we calculated the percent of unscheduled ED returns and percent of subsequent hospital admissions using as a denominator the total number of patient visits > 65 years of age. We calculated 95% confidence intervals (CIs), and also performed a linear regression analysis by year.

Results: There were 3,332,610 patients over the age of 65 in the database. From 1996 to 2010 there was a 38% (95% CI 33% to 44%, p<0.001) increase in the percent of return visits to the ED from 2.1% to 2.9% and a 53% (95% CI 44% to 62%, p<0.001) increase in return subsequent hospital admissions from the ED from 1.0% to 1.6%. The linear regression for returns to ED and return hospital admissions versus year yielded R squared = 0.84 (p < 0.0001) and 0.88 (p < 0.0001), respectively.

Conclusion: We found an increase in the percents of ED returns and subsequent hospital admissions through the ED within 72 hours of prior ED discharge for geriatric patients between the years 1996 and 2010. We speculate that this is due in part to increased scrutiny by Medicare and other insurance payers regarding hospital admissions and lengths of stay.

Table 1

<table>
<thead>
<tr>
<th>Diagnostic group</th>
<th>Mean time (hrs)</th>
<th>Lower Quartile (25%)</th>
<th>Median (50%)</th>
<th>Upper Quartile (75%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal diseases</td>
<td>57.4</td>
<td>24.1</td>
<td>46.5</td>
<td>80.7</td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>50.3</td>
<td>22.1</td>
<td>38.9</td>
<td>70.6</td>
</tr>
<tr>
<td>ENT/dental/mouth</td>
<td>55.1</td>
<td>24.7</td>
<td>45.7</td>
<td>74.4</td>
</tr>
<tr>
<td>Trauma</td>
<td>57.8</td>
<td>21.1</td>
<td>43.5</td>
<td>90.6</td>
</tr>
<tr>
<td>Neurologic diseases</td>
<td>58</td>
<td>19.7</td>
<td>44.3</td>
<td>91.6</td>
</tr>
</tbody>
</table>

2229 Inappropriate Imaging for Emergency Department Patients With Suspected Pulmonary Embolism: Defining the Performance Gap

Arjun K Venkatesh1, Jeffrey Kline2, D. Mark Courtney2, Carlos A. Camargo4, Kristen Nordenholz3, Christopher Moore1, Michael Plewa7, Peter Richman3, Howard Smithline9, Darren Beam2, and Christopher Kabrhel2
1Brigham and Women’s Hospital-Massachusetts General Hospital-Harvard Affiliated Emergency Medicine Residency, Boston, MA; 2Carolina’s Medical Center, Charlotte, NC; 3Northwestern Memorial Hospital, Chicago, IL; 4Massachusetts General Hospital, Boston, MA; 5University of
Background: The National Quality Forum (NQF) recently endorsed a performance measure to reduce imaging in low-risk emergency department (ED) patients evaluated for pulmonary embolism (PE). Prior studies suggest imaging overuse, but no prospective study has quantified the performance gap, and thus, the potential for improvement.

Objectives: Describe the magnitude of inappropriate imaging (performance measure failure) in ED patients with suspected PE and identify patient-level predictors of inappropriate imaging.

Methods: We analyzed data from a prospective, multicenter observational study of ED patients evaluated for PE from 2004 to 2007. We prospectively collected demographics and data necessary to calculate the Wells Score. We excluded unstable patients (SBP <90 mmHg). Diagnostic testing was performed at the discretion of treating physicians, and results were collected using a standardized data collection instrument. Performance measure failure was defined as imaging in patients with Wells Score <2 in whom a D-Dimer (DD) test was either not done or was normal. We performed multivariable logistic regression to identify patient predictors of inappropriate imaging.

Results: We enrolled 5940 patients: 3966 (67%) female, 3552 (60%) white, mean age 49±17 years. Of 4113 (69%) low pre-test probability patients, 3,235 (76.6%) had DD testing performed, and 2016 (49.0%) had a negative DD result. There were 2230 low-risk patients who had imaging done, of whom 811 (36.2%) had no DD testing, and 394 (27.6%) had negative DD results. In total, 1205/5940 (20.3%, 95% CI 19.3–21.3) patients had inappropriate imaging per the NQF measure. Inappropriate imaging due to failure to order a DD was associated with age (OR 1.17 per decade, 95%CI 1.11–1.24). Inappropriate imaging following a negative DD was associated with inactive malignancy (OR 1.66, 95%CI 1.11–1.24).

Conclusion: In this prospective study, 20% of patients who had imaging for suspected PE had inappropriate imaging according to a new NQF measure. There is substantial room for quality improvement. Age and malignancy are associated with inappropriate imaging, and may be useful as performance measure exclusions. Future research should identify provider and hospital level predictors of imaging utilization to reduce unnecessary testing and costs.

230 The Mortality Benefit Threshold for Patients With Low-risk Suspected Pulmonary Embolism

Jesse M Pines1 and Adam L Lessler2
1George Washington University, Washington, DC; 2University of Pennsylvania, Philadelphia, PA

Background: The search for and treatment of pulmonary embolism (PE) in the emergency department (ED) is based on the assumption that the benefits of treating PE outweigh the risk of testing (e.g., cancer from radiation, acute renal failure [ARF] from contrast, and anticoagulation [AC] complications). Recent data show ARF complications are higher than previously thought, including death from ARF or dialysis-dependent ARF in almost 1% of patients who receive a CT (Mitchell AM et al. Clin J Am Soc Nephrol 2010).

Objectives: Using the latest data, we calculated how large the mortality benefit between treated and untreated PE would need to be to justify testing patients at various risk levels for PE.

Methods: We built a decision model using TreeAge Pro for a 25 year-old female with suspected PE. We obtained model inputs from the literature and used clinical judgment when data were unavailable. A Markov model was used for the ongoing risk of mortality from a contrast reaction, acute renal failure, and AC major bleeding risk. Moderate drivers: D-Dimer sensitivity, mortality from treated PE, annual cancer risk, mortality from ARF, and AC major bleeding risk. Moderate drivers: D-Dimer sensitivity, CT specificity, probability of recurrent PE, bleeding complications, and mortality from GI bleeding. Minimal drivers: annual cancer mortality, mortality from a contrast reaction, rate of dialysis-dependent ARF, and mortality from intracranial bleeding.

Conclusion: The needed mortality benefit for treating PE to outweigh the risks of testing is very large at low PTPs and likely exceeds the true mortality benefit. The new estimate of the risks of complications from ARF needs to be validated with additional studies. However, given these new data, PE testing and treatment in low-risk ED patients may be of questionable benefit from a population perspective.
232 Normalization of Vital Signs Does Not Reduce the Probability of Pulmonary Embolism
Jeffrey Kline, Dianne Corredor, Jackeline Hernandez, and Alan Jones
Carolina Medical Center, Charlotte, NC

Background: In considering the need to evaluate symptomatic patients for possible pulmonary embolism (PE), some clinicians hypothesize that normalization of vital signs (VSs) reduces the pretest probability of PE. No published data have tested this hypothesis.

Objectives: Quantify and compare the change in heart rate (HR), respiratory rate (RR), and pulse oximetry (SaO2) in patients undergoing diagnostic testing for PE.

Methods: Prospective, noninterventional, single-center study of emergency department (ED) patients with at least one symptom, one sign, and one risk factor for PE and for whom CT pulmonary angiography was performed. Informed consent was obtained. The criterion standard for PE+ and PE- was the radiologist interpretation of computed tomography pulmonary angiography (CTPA). Vital signs were abstracted from the ED record. Sample size was n = 180 assuming 20% PE+ patients to provide an 80% power to detect a 10% difference in mean change in heart rate between groups at α = 0.05.

Results: One hundred and eighty patients enrolled, with 35 (19.4%) PE+. At least two sets of vital signs were documented in 174 (97%); the mean time between triage to the second (Δ1) and triage to the third (Δ2) VS sets were 176±127 and 263±144 min, respectively. The Table shows no significant differences between PE+ vs. PE- for either the mean values for any VS, or the means of their relative changes during Δ1 and Δ2. At triage, 12/35 PE+ and 17/35 PE- patients had HR>99 and 8/12 (67%) PE+, and 33/52 (65%) PE- patients normalized their HR.

Conclusion: Among patients evaluated for possible PE, PE+ patients show similar changes in VS over time compared with PE- patients, and similar rates of normalization. These data argue against the hypothesis that normalization of vital signs reduces the pretest probability of PE.

<table>
<thead>
<tr>
<th>Change in Vital Signs</th>
<th>Δ1 (mean relative change)</th>
<th>Δ2 (mean relative change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS</td>
<td>Triage</td>
<td>Second</td>
</tr>
<tr>
<td>HR PE+</td>
<td>94±23</td>
<td>88±22</td>
</tr>
<tr>
<td>HR PE-</td>
<td>90±21</td>
<td>87±20</td>
</tr>
<tr>
<td>RR PE+</td>
<td>20±5</td>
<td>19±4</td>
</tr>
<tr>
<td>RR PE-</td>
<td>21±5</td>
<td>20±6</td>
</tr>
<tr>
<td>SaO2 PE+</td>
<td>96±3</td>
<td>97±4</td>
</tr>
<tr>
<td>SaO2 PE-</td>
<td>97±3</td>
<td>97±3</td>
</tr>
</tbody>
</table>

233 Does Health Literacy Impact the Diagnostic Accuracy of Cognitive Screening Instruments?
Christopher R Carpenter1, Max Palatnik1, Abdullah Abdussalam1, Niraj Butala1, Jeffrey Piccirillo1, Anne Godbout1, and James E Galvin2
1Washington University in St. Louis, St. Louis, MO; 2New York University Langone Medical Center, Department of Neurology, New York City, NY

Background: Brief screening instruments to identify geriatric emergency department patients at increased risk of cognitive dysfunction have recently been validated using the Mini Mental Status Exam (MMSE) as the criterion standard. Patient reading and educational level may affect the diagnostic accuracy of these instruments.

Objectives: To assess the sensitivity, specificity, and likelihood ratios for the Brief Alzheimer’s Screen (BAS), Short Blessed Test (SBT), and caregiver-administered AD8 (cAD8) using MMSE < 24 as the criterion standard stratified by two measures of health literacy: the Rapid Estimate of Adult Literacy in Medicine—Short Form (REALM-SF score) < 7 (less than 9th grade reading level) and a self-reported highest level of education of less than 12th grade. Delirium was assessed using the Confusion Assessment method (CAM)-ICU.

Methods: A prospective cross-sectional convenience sampling was conducted at one urban medical center emergency department (ED). Eligible subjects were consenting English-speaking patients over age 65 years who had not received potentially sedating medications. A research assistant administered the criterion standard MMSE along with the BAS, SBT, cAD8, REALM-SF, and CAM-ICU. Diagnostic test characteristics were stratified by REALM-SF estimated health literacy and self-reported education level.

Results: Among the 142 patients, 34% were male, mean age was 77-years, and 61% were admitted. MMSE < 24 was identified in 34%. No patient had delirium. REALM-SF scores indicated that 57% had a reading level above 9th grade and 47% reported attaining a high school degree. Overall, the SBT had the best diagnostic accuracy with LR+ 1.7 and LR- 0.22 although the 95% CI overlapped with the BAS and cAD8. When stratified by both highest level of education attained and health literacy, the cAD8 demonstrated higher sensitivity and lower LR- than the SBT or BAS for higher educated and more highly health literate patients. On the other hand, the SBT and BAS had higher sensitivity and lower LR-in less educated and lower health literate patients.

Conclusion: The cAD8 is a more sensitive ED screening instrument to identify cognitive dysfunction in geriatric patients with higher health literacy or education beyond high school. The SBT or the BAS are more sensitive instruments in less-educated patients or in those who did not attain a high school equivalent education.

| Cognitive Screening Instrument Diagnostics Accuracy Stratified by Health Literacy |
|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| Sen (95% CI) | Spec (95% CI) | LR+ (95% CI) | LR- (95% CI) |
| Total           | Under 9th reader | Under 9th reader | Under 9th reader | Total           | Under 9th reader | Under 9th reader | Under 9th reader |
| BAS             | 09           | 03           | 16           | 04           | 19           | 02           | 13           | 05           |
| SBT             | 09 67 87 71   | 47 35 53 44 50 | 1.7 1.5 1.4 1.6 1.4 | 0.22 0.20 0.62 0.29 0.59 |
| cAD8            | 83 70 100 75 100 | 65 46 77 64 67 | 2.4 1.3 4.4 2.1 3 | 0.26 0.65 0 0.39 0 |
Background: The Mini Mental Status Exam (MMSE) is often used as the criterion standard for cognitive dysfunction to assess the diagnostic accuracy of alternative screening instruments. However, due to the possibility of a test-retest learning bias, observed diagnostic test performance may vary for cognitive performance assessments depending upon the order of administration of the test instrument with the criterion standard.

Objectives: To assess the sensitivity, specificity, and likelihood ratios for the Brief Alzheimer’s Screen (BAS), Short Blessed Test (SBT), and caregiver-administered AD8 (cAD8) stratified by the order of administration of the MMSE with the test instruments using MMSE < 24 as the criterion standard for cognitive dysfunction.

Methods: A prospective cross-sectional convenience sampling was conducted at one urban medical center emergency department (ED). Eligible subjects were consenting English-speaking patients over age 65 years who had not received potentially sedating medications. Patients were randomly selected via sealed opaque envelope to have the MMSE obtained before or after the BAS, SBT, and cAD8. The diagnostic test characteristics of the BAS, SBT, and cAD8 were compared for both subsets using chi-square analysis.

Results: Among the 142 patients, 34% were male, mean age was 77-years, and 61% were admitted. MMSE < 24 was identified in 34%. Of the remaining 90 with an MMSE 24 or greater, 73 (81%) had an abnormal MoCA defined as MCI for this study. None of the brief screening instruments were sufficiently sensitive for MCI, but the cAD8 and the SBT were specific. The SBT had the highest positive likelihood ratio to rule in the diagnosis of MCI.

Conclusion: In the validation of novel cognitive assessment screening instruments using the MMSE as the criterion standard, the order of administration of the new test with the gold standard does not affect observed diagnostic accuracy.

### Diagnostic Test Characteristics Stratified by Order of MMSE Administration

<table>
<thead>
<tr>
<th></th>
<th>Sen, % Total cohort</th>
<th>Spec, % Total cohort</th>
<th>LR+, Total cohort</th>
<th>LR-, Total cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MMSE First</td>
<td>MMSE Last</td>
<td>MMSE First</td>
<td>MMSE Last</td>
</tr>
<tr>
<td>BAS</td>
<td>90</td>
<td>43</td>
<td>1.57</td>
<td>0.24</td>
</tr>
<tr>
<td>SBT</td>
<td>88</td>
<td>41</td>
<td>1.49</td>
<td>0.30</td>
</tr>
<tr>
<td>cAD8</td>
<td>83</td>
<td>65</td>
<td>2.37</td>
<td>0.26</td>
</tr>
</tbody>
</table>

### Diagnostic Test Characteristics for MCI

<table>
<thead>
<tr>
<th></th>
<th>Sen % (95% CI)</th>
<th>Spec % (95% CI)</th>
<th>LR+ (95% CI)</th>
<th>LR- (95% CI)</th>
<th>ROC AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAS</td>
<td>62 (57–66)</td>
<td>65 (44–82)</td>
<td>1.76 (1.01–3.62)</td>
<td>0.59 (0.42–0.99)</td>
<td>0.742 (0.614–0.871)</td>
</tr>
<tr>
<td>SBT</td>
<td>63 (59–65)</td>
<td>88 (68–97)</td>
<td>5.39 (1.84–19.51)</td>
<td>0.41 (0.36–0.61)</td>
<td>0.799 (0.692–0.906)</td>
</tr>
<tr>
<td>cAD8</td>
<td>40 (34–41)</td>
<td>89 (60–98)</td>
<td>3.56 (0.84–20.59)</td>
<td>0.68 (0.60–1.11)</td>
<td>0.506 (0.345–0.666)</td>
</tr>
</tbody>
</table>
Conclusion: The MoCA may not be the optimal criterion standard to identify MCI in the ED. The other possibility is that geriatric adults in the ED have a high prevalence of MCI. Using MoCA-defined MCI, the SBT, BAS, and cAD8 are not sensitive instruments. The SBT is the best instrument to rule in the diagnosis of MCI, but the positive likelihood ratio is still suboptimal.

236 How Accurate Are Emergency Department Physicians and Nurses at Assessing Delirium Among Elderly Emergency Department Patients?
Beth Israel Deaconess Medical Center, Boston, MA

Background: Delirium is common in elderly patients but often under-diagnosed in the emergency department (ED). However, it is not feasible to formally test all elderly ED patients for delirium.

Objectives: The study objectives were: 1) to quantify ED physician and nurse “gestalt” accuracy in assessing delirium, and 2) to determine whether there is a feasible cut-point for delirium estimation at which elderly patients should be formally tested.

Methods: We performed a prospective, observational study of elderly patients in our urban university ED. Inclusion criteria: ED patient > = 65 years, ability to cooperate with testing, informed consent obtained from patient/surrogate, and physician and nursing estimates obtained. A trained researcher performed a structured mental status assessment including the Folstein Mibi-Mental State Examination (MMSE) and Delirium Symptom Interview. Delirium was determined using the Confusion Assessment Method (CAM). We asked ED physicians and nurses to provide a point estimate of the probability of delirium (0 to 100% scale). We calculated medians and interquartile ranges, made comparisons with Wilcoxon Rank-Sum, assessed for correlation using the Spearman method, used logistic regression to calculate a c-statistic for model accuracy, and evaluated the sensitivity and specificity for differing cut points.

Results: Two hundred and seventy-one subjects were enrolled, of whom 16 (6%) were delirious by the CAM. Median estimates and interquartile ranges are presented in Table 1; physician and nurse estimates were significantly higher in delirious subjects compared to non-delirious subjects (p<0.001 for both comparisons). Physician and nurse estimates were moderately correlated (0.44, p<0.001). The c-statistics for physician and nurse estimates were 0.83 and 0.77 respectively. Sensitivities, specificities, percentage of subjects tested, and delirium cases missed for different physician and nurse cut-points are reported in Table 2.

At a physician cut-off of >55% probability of delirium, 37% of elderly ED patients would be tested in order to detect 81% of delirious subjects. Using a physician cut-off of > 25%, 7% of patients would be tested, but only 56% of delirious subjects would be detected.

Conclusion: Physicians and nurses demonstrate good discriminatory ability in diagnosing delirium. Physician estimates yield greater sensitivity but at the cost of testing a greater number of subjects to diagnose delirious patients.

Table 1: Physician and Nurse Median Estimates for Delirious and Non-Delirious Subjects

<table>
<thead>
<tr>
<th>Assessor</th>
<th>Median Estimate</th>
<th>25-75% Interquartile Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Delirious Subjects</td>
<td>MD 0</td>
<td>0 to 5</td>
</tr>
<tr>
<td>Delirious Subjects</td>
<td>MD 40</td>
<td>5 to 50</td>
</tr>
<tr>
<td>Non-Delirious Subjects</td>
<td>RN 0</td>
<td>0 to 0</td>
</tr>
<tr>
<td>Delirious Subjects</td>
<td>RN 26</td>
<td>0 to 50</td>
</tr>
</tbody>
</table>

Table 2: Test Characteristics for Different Cut-Points of Delirium Assessment

<table>
<thead>
<tr>
<th>Assessor</th>
<th>Cut-Off for Testing</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Subjects Tested, n (%)</th>
<th>Delirious Subjects Missed, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD</td>
<td>5</td>
<td>81%</td>
<td>65%</td>
<td>101 (37%)</td>
<td>3 (19%)</td>
</tr>
<tr>
<td>MD</td>
<td>10</td>
<td>69%</td>
<td>82%</td>
<td>58 (21%)</td>
<td>5 (31%)</td>
</tr>
<tr>
<td>MD</td>
<td>25</td>
<td>56%</td>
<td>96%</td>
<td>20 (7%)</td>
<td>7 (44%)</td>
</tr>
<tr>
<td>MD</td>
<td>50</td>
<td>38%</td>
<td>98%</td>
<td>12 (4%)</td>
<td>10 (62%)</td>
</tr>
<tr>
<td>RN</td>
<td>5</td>
<td>56%</td>
<td>94%</td>
<td>20 (11%)</td>
<td>7 (44%)</td>
</tr>
<tr>
<td>RN</td>
<td>10</td>
<td>50%</td>
<td>94%</td>
<td>23 (8%)</td>
<td>8 (50%)</td>
</tr>
<tr>
<td>RN</td>
<td>25</td>
<td>38%</td>
<td>98%</td>
<td>12 (4%)</td>
<td>10 (62%)</td>
</tr>
<tr>
<td>RN</td>
<td>50</td>
<td>31%</td>
<td>99%</td>
<td>7 (3%)</td>
<td>11 (69%)</td>
</tr>
</tbody>
</table>

237 A Comparison of Asynchronous Web-based Learning and Traditional Educational Conferences on Medical Knowledge Acquisition Among Emergency Medicine Residents
Ali Pourmand1, Raymond Lucas1, and Mehdi Nouraie2
1George Washington University, Washington, DC; 2Howard University, Washington, DC

Background: Grand Rounds are an educational opportunity to improve the consistency and the quality of resident education.

Objectives: To compare medical knowledge acquisition between emergency medicine (EM) residents who attend weekly core content lectures with those absent but asynchronously viewing the same lectures in a web-based electronic format.

Methods: During the study period all EM residents attending or absent from weekly educational conferences were given a written test on the covered material. During phase one, absentees were not given supplemental educational content for missed lectures. During phase two, absentees were sent a link to an online module containing an audiovisual recording and the PowerPoint slides of the actual missed lecture. Scores between attendees and absentees during both phases were compared using a repeated measures analysis to evaluate the effect of the supplemental online module on knowledge acquisition. Panel data analysis was performed using generalized estimating equations (GEE).

Results: Thirty-nine EM residents (equally distributed in post-graduate 1 to 4) were studied during a 15-week period. The average number of total residents who completed the quizzes was 72% and average lecture attendance was 70% during the study period. Scores for attendees and absentees were plotted at baseline and after the study intervention (see Figure 1). During phase one, lecture attendance was associated with a significantly higher score (P <0.0001). Overall and after adjusting for sex and post-graduate year level, both lecture attendance (b = 28, 95% CI = 23–33, P <0.001) and web-based training (b = 32, 95% CI = 28–37, P <0.001) were associated with significant increases in test scores compared to residents who were absent and not receiving supplemental web-based training. Neither the self-perceived level of mastery
Background: Simulation can be used to accurately educate, simulate session they were again evaluated using the OCMGRS. An experimental simulation curriculum that focuses on communication, leadership, and problem-solving markedly improved the OCMGRS for those residents who participated.

239 Evaluation of a Curriculum to Educate Emergency Medicine Residents in Informed Consent
Katrina A Leone1, David H. Salzman2, Kelly Williamson3, Shera Teigté3, and John A. Vozenilek4
1Oregon Health and Science University, Portland, OR; 2Northwestern University, Chicago, IL

Background: Emergency medicine (EM) residents are exposed to the ethical concept of informed consent (IC) while working in the emergency department (ED), but formal teaching of IC is often absent from residency didactic curricula. We created a curriculum to educate EM residents on the principles of IC for three common ED procedures: central line placement, blood transfusion, and lumbar puncture.

Objectives: The efficacy of this curriculum was evaluated using pre- and post-intervention assessments designed to measure how the teaching altered resident knowledge of procedure indications, risks, and alternatives, as well as confidence and skill for performing informed consent in a simulated patient encounter.

Methods: The curriculum was administered to residents in a series of four online, self-directed instructional modules. Residents then participated in a small-group session where they practiced IC conversations through role-play. The curriculum was evaluated using a prospective, pre-experimental study design. Forty-five residents in an urban, PGY1-4 EM residency participated. Three tools were used to assess the curriculum. Knowledge of procedure indications, risks, and alternatives was measured by a 25 question multiple-choice exam. 100 mm visual analog scales (VAS) were used to quantify resident confidence for performing IC. A 16-item checklist was used to assess performance during an IC discussion with a simulated patient.

Results: Mean written exam scores changed from 55.8% pre-intervention to 61.2% post-intervention (change 5.5%, 95% CI 1.39–8.07, p = 0.07). In simulation, residents completed an average of 80.4% of checklist items pre-intervention and 78.9% post-intervention (change –1.5%, 95% CI –8.47 to 5.47, p = 0.663) when scored by the standardized patient. Resident self-scoring produced means of 77.4% pre-intervention and 81.0% post-intervention (change 3.6%, 95% CI –2.79 to 9.99, p = 0.252).

Conclusion: Implementation of this IC curriculum improved resident knowledge of, and confidence to perform IC, though we were unable to demonstrate a difference in performance when measured by checklist during a standardized patient encounter.

240 Implementation of a Basic Procedural Skills Course for Emergency Medicine Intern Orientation
Nicholas Borm, Nicholas Hartman, Ashley Peko, Sara Friedman, Michael A Gisondi, John A Vozenilek, and David H Salzman
Northwestern University, Chicago, IL

Background: Interns matriculate to residency with variable experience and ability to perform basic procedures necessary to the initial assessment and management of any emergency department (ED) patient.

Objectives: We hypothesized that a focused skills curriculum during orientation would result in improvement in interns’ ability to perform basic procedures, including the placement of a
peripheral intravenous (IV) line, basic phlebotomy, initiation of IV fluids, placing a patient on a cardiac monitor, and obtaining an EKG.

**Methods:** This IRB-approved prospective observational cohort study occurred at a PGY 1-4 emergency medicine (EM) residency program at an urban, university-based medical center. All PGY 1 emergency medicine residents (EMRs) attending orientation who provided consent were included. Following completion of a pre-intervention assessment tool, the participants received didactic instruction, practiced skills using task trainers, and shadowed clinical nurses to demonstrate competency in basic procedural skills. Following the intervention, participants completed a post-test assessment for changes in the comfort levels and knowledge with basic procedural skills.

**Results:** 11/12 (91.6%) of the incoming PGY 1 EMRs participated. The cohort consisted of six (54.5%) males and five (45.5%) females with a mean age of 27. Paired t-test evaluation of pre and post intervention scores on a 5-point Likert confidence scale revealed that participants significantly increased their comfort level with IV starts (p = 0.008), placing a patient on the cardiac monitor (p = 0.005), and obtaining an EKG (p = 0.0003). Paired t-test evaluation of the pre- and post-test scores demonstrated a statistically significant improvement in knowledge (p = 0.008).

**Conclusion:** Implementation of a basic procedural skills course during intern orientation, using didactic instruction, task trainers, and supervised practical application, may increase subjective confidence levels and knowledge of incoming PGY1 EMRs performing basic procedural skills.

### Impact of a Geriatric Curriculum on Emergency Medicine Resident Attitudes, Knowledge, and Decision-making

**241**

**Kevin Biese,** Michael LaMantia, Zeke Zamora, Fran Shofer, Graham Snyder, Ellen Roberts, Amar Patel, John S Kizer, and Jan Busby-Whitehead

1University of North Carolina at Chapel Hill, Chapel Hill, NC; 2WakeMed Health & Hospitals, Raleigh, NC

**Background:** Despite an increasing number of elderly emergency department (ED) patients, emergency medicine (EM) training lacks geriatric-specific curricula.

**Objectives:** We sought to determine if a 1 year geriatric curriculum would affect attitudes, knowledge, and decision-making for older patients seen in the ED.

**Methods:** We created a 1 year geriatric curriculum for EM residents comprised of six lectures on trauma, abdominal pain, and high fidelity simulations on similar topics. Before and after completion of the curriculum, residents were assessed in 1) attitudes towards caring for geriatric patients using a validated survey, 2) knowledge of geriatric principals of care using a 35 question multiple choice test, and 3) rates of urinary catheter placement during 1 month periods before and after the curriculum as a measure of decision-making. Appropriateness of urinary catheter placement was determined by two physician reviewers using criteria adapted from the Centers for Disease Control and Prevention indications for appropriate urinary catheter use. Reviewers met to adjudicate any disagreements about appropriateness. To determine differences before and after the new curriculum was implemented, the paired t-test was performed on pre and post knowledge and attitude scores. Fisher’s exact test was used to examine differences in rates of use of urinary catheter placement.

**Results:** Twenty-nine EM residents underwent the training. There was no measured change in attitudes. Knowledge improved from the pre to post test with average scores of 58.5% and 68.0%, respectively (p<0.0001) among the 25 residents who completed both tests. There was a small non-significant decrease in the rate of urinary catheter placement from before to after the curriculum (7.4% vs 5.9%, p=0.3). Rates of inappropriate urinary catheter placement significantly decreased after the curriculum, from 8 of 49 to 1 of 47 (16.3% vs 2.1%, p = 0.03).

**Conclusion:** Geriatric educational curricula for EM residents may positively affect the knowledge base and decision-making. These educational enhancements may place elderly patients at less risk of adverse outcomes.

### A 360 Degree Evaluation of the University of Chicago Teaching Resident Experience

**James Ahn, Alyssa Bryant, and Christine Babcock**

University of Chicago, Chicago, IL

**Background:** Rising patient volumes and crowding have challenged academic emergency departments to deliver consistent and high quality clinical education. In 2006, the University of Chicago Emergency Medicine Residency defined a distinct resident role independent of primary clinical responsibilities dedicated to teaching. This role, titled the teaching resident (TR), has been fully integrated into the curriculum for the past three years and has been anecdotally lauded.

**Objectives:** Similar TR programs have been documented in the literature but with no mention of the educational value. Literature demonstrates positive value in resident-as-teachers curricula in medical education, however, not specifically emergency medicine. Our goal was to measure the effect of the TR position upon the learning environment.

**Methods:** A survey instrument was constructed and distributed to all current faculty members, residents, and fourth year medical students. The perception of patient flow, ease of procedures, and medical student learning with and without the presence of the TR was evaluated on a Likert scale. Other metrics measured were continuity of care, quality of patient care, and overall learning with the addition of the TR.

**Results:** Analysis of the faculty, resident, and medical student perceptions showed that presence of the TR was felt to have significant impact (p<0.05) on procedure performance and medical student learning. The faculty and residents felt that the presence of the TR had a significant effect on patient flow (Table 1). Faculty and residents also felt that the presence of the TR positively affected continuity of care and clinical care. All three groups felt that the TR was valuable as an educational tool (Table 2). All other data are displayed below.

**Conclusion:** The TR role provides an important learning tool for junior residents and medical students. Survey data support the anecdotal finding that practitioners and learners value the TR presence. Stakeholders’ perceptions of patient flow, procedure performance, and medical student teaching were all improved with the presence of the TR. Our results support existing literature that residents-as-teachers programs demonstrate positive effect. Further work will need to be done to formalize a strict resident-as-
Stakeholders Perception of Teaching Resident Impact

<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Resident</th>
<th>Medical Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity of Care</td>
<td>3.375</td>
<td>3.77</td>
<td>not measured</td>
</tr>
<tr>
<td>Clinical Care</td>
<td>4.13</td>
<td>4.08</td>
<td>not measured</td>
</tr>
<tr>
<td>Resident Learning</td>
<td>4.29</td>
<td>4.0</td>
<td>not measured</td>
</tr>
<tr>
<td>Value as an Educational Tool</td>
<td>4.13</td>
<td>4.26</td>
<td></td>
</tr>
<tr>
<td>Overall Experience</td>
<td>4.13</td>
<td>4.0</td>
<td>4.05</td>
</tr>
</tbody>
</table>

243 Assessment of Competency in Emergency Resident Skills: Do We Really Need To Be There?
Joseph B House, Suzanne Dooley-Hash, Terry Kowalenko, Desiree Seeaye, John G Younger, and Michele M Nypaver
University of Michigan, Ann Arbor, MI

Background: Real-time assessment of operator performance during procedural simulation is a common practice with numerous shortcomings, including the need for one or more expert reviewers to be present for every case and a demand for undivided reviewer attention over potentially many repetitions of the same case. Off-line video review might overcome these problems but has not been evaluated for superiority in this context.

Objectives: In this project, we used an established simulated pediatric rapid sequence intubation (pRSI) case to test the hypothesis that reviewers displayed better inter-rater agreement of procedural competency when using recorded, rather than live, review.

Methods: A previously established Objective Structured Assessment of Technical Skills (OSATS) tool for pRSI was used. Emergenc medicine residents (PGY 1-4) were prospectively enrolled in a standardized pRSI scenario (SimBaby™ Laerdal) and were evaluated by two live raters using the OSATS tool. Each session was videotaped with a camera position focused on the face of the simulator and one focused on the entire simulator. At least four months later (range 4–10 months), the videotaped sessions were reviewed by the same two raters, blinded to initial rating. Inter-rater agreement was determined using Krippendorff’s generalized concordance method which scales rater performance between -1 (absolute disagreement) and +1 (absolute agreement). Ninety-five percent confidence intervals were calculated.

Results: A total of 49 residents were enrolled (12 each from PGY 1-3 and 13 from PGY 4). All residents had complete live reviews. Three video reviews were excluded due to poor audio. Overall inter-rater agreement for live review was 0.75 (95% CI = 0.72, 0.78) and for video was 0.79 (0.73, 0.82). Live review was significantly superior to video review in one of the OSATS domains (preparation), but video was favored in six of the seven remaining domains evaluated by reviewers.

Conclusion: Video evaluation of procedural simulation provided reviewer performance at least as reliable as live review, and has substantial potential in simplifying OSATS use when evaluation of many operators is anticipated.

244 Do Emergency Medicine Residents Retain Key Concepts in Hospice and Palliative Care After an Educational Intervention?
Travis E. DeVader and Rebecca Jeannomon
St. Luke’s Hospital and Health Network, Bethlehem, PA

Background: Patients at the end-of-life present to the emergency department (ED) daily. The emergency physician must have an appropriate skill set in palliative medicine.

Objectives: The objectives of this study are to: 1) determine how well emergency medicine (EM) residents retain key concepts in hospice and palliative care after an educational intervention; 2) determine if education in hospice and palliative care for emergency physicians influences individual physician’s reported practice and referral patterns.

Methods: This is a prospective cohort study performed at a Level I trauma center. The study protocol was approved by the IRB. A survey was developed regarding knowledge of palliative care and its ED utilization and administered to EM residents. Subsequently, residents underwent four hours of palliative care training. An identical post-education survey was administered immediately and then 6 months later.

Results: The ability to identify several hospice qualifying diagnoses was maintained at 6 months: aortic stenosis (p = 0.0002), deblility (p = 0.007), failure to thrive (p = 0.01), Alzheimer’s disease (p = 0.02), and multiple sclerosis (p = 0.02). Resident knowledge improved in converting between oral and intravenous formulations of morphine and dilaudid immediately post education, but was not maintained at 6 months (p=0.05). There was no statistically significant improvement in residents’ comfort level in managing pain or dyspnea. Residents rated their comfort discussing end of life issues as a 3.2/4 (median/mean) on a five-point scale prior to the educational intervention, which improved to 3.8/4 (mean/median) (p = 0.03) post education. This was maintained at 6 months (mean/median of 3.7/4, p = 0.05). Prior to and immediately following the educational intervention, 61% of residents reported they had never referred a patient to hospice or palliative care out of the ED (p = 1). At 6 months, 80% of residents reported referring a patient to hospice or palliative care (p = 0.002).

Conclusion: An educational intervention is effective in teaching and maintaining knowledge of hospice qualifying diagnoses, but is not able to improve residents’ knowledge in the conversion of opioids or increase comfort levels in managing pain and dyspnea. However, it is shown to increase comfort in discussing end-of-life care and to increase the number of residents who refer patients to hospice from the ED.

245 The ‘RAPID’ Approach to Managing Emergency Department Patients Improves Emergency Medicine Clerkship Written Exam Performance
Robert A Woods1, Krista Trinder1, Marcel D’Eon1, and John PG McAlee2
1University of Saskatchewan, Saskatoon, SK, Canada; 2University of Dundee, Dundee, United Kingdom

Background: The ‘RAPID’ mnemonic has been previously described as an approach to managing emergency department patients. It was designed as a mental checklist to help junior trainees focus on all aspects of patient care in a comprehensive and efficient manner, addressing issues in order of priority. Its actual impact on trainee performance has not been assessed.

Objectives: We set out to see if a pocket card and a one-hour teaching session based on the ‘RAPID’ mnemonic (Resuscitation, Analgesia & Assessment, Patient Needs, Interventions, Disposition) at the start of the emergency medicine clerkship rotation would affect performance.

Methods: Medical students on their emergency medicine clerkship rotation received or did not receive the teaching intervention on an alternate basis. Students were assessed through daily encounter cards, a case presentation, a self-assessment form, focus groups, a pre-rotation case, and a short answer exam with the pre-rotation case repeated.

Results: Forty-two students were enrolled, 21 in each group. Students in the intervention group had a significantly higher improvement in the pre-rotation case (1.82 vs 0.26, p = 0.012), and a higher overall exam score (75.13 vs 70.42, p = 0.046). Students in the focus groups described the mnemonic as useful, referring to it 2-3 times per shift. They felt it helped them to remember about pain management and social issues. It also made them think more closely about why they were ordering tests.

Conclusion: Exposure to the ‘RAPID’ approach to emergency department patients at the start of an emergency medicine
Focused Education in the Emergency Department (FEED): Enhancing Education Through Scheduled Teaching Shifts

Amy E Pattishall1, Daniel H. Hirsh1, Brian E. Costello1, Ashley S. Smith2, Michael Greenwald3, Harold K. Simon1, and Naghma S. Khan1
1Emory University School of Medicine, Children’s Healthcare of Atlanta, Atlanta, GA; 2Children’s Healthcare of Atlanta, Atlanta, GA

Background: Pediatric emergency department (PED) faculty must balance their time between clinical and teaching responsibilities when working in the PED. Increasing volumes and expectations for clinical productivity and efficiency can have a negative effect on teaching.

Objectives: To study the effect of a focused, scheduled, 3-hour resident/student teaching shift, in which faculty have no clinical responsibility on resident evaluations of PED faculty’s teaching.

Methods: Three-hour teaching shifts with faculty were implemented in two high-volume PEDs in July 2009. The teaching components of the end-of-rotation evaluation of faculty by residents were reviewed prior to and after the intervention implementation. Also, teaching shift evaluations were compared to post-intervention end-of-rotation evaluations using the one question common to both the end-of-rotation and teaching shift evaluations when working in the PED. Increasing volumes and expectations for clinical productivity and efficiency can have a negative effect on teaching.

Results: There was a 9% improvement in the ‘Exemplary’ category of the end-of-rotation evaluations (p<0.001). Further, when comparing the one question common to both the end-of-rotation and teaching shift evaluations, learners rated teaching effectiveness as ‘Exemplary’ 54% and 72%, respectively (p<0.001).

Conclusion: At the study institution, there was both an improvement in evaluations of faculty teaching in the global end-of-rotation evaluation, and a large increase in the number of ‘Exemplary’ ratings for teaching effectiveness in the teaching-shift evaluations compared to the post intervention end-of-rotation evaluations. Dedicated teaching shifts in which faculty have no clinical responsibility enhanced learners’ educational experience and resulted in improved teaching satisfaction.

Distribution of Likert Scale Ratings on Teaching Components of End-of-Rotation Evaluations

<table>
<thead>
<tr>
<th>Likert Scale Rating</th>
<th>2008 (n=4608)</th>
<th>2010 (n=6809)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>79 (2%)</td>
<td>62 (1%)</td>
</tr>
<tr>
<td>2</td>
<td>623 (14%)</td>
<td>953 (14%)</td>
</tr>
<tr>
<td>3</td>
<td>1879 (41%)</td>
<td>2197 (32%)</td>
</tr>
<tr>
<td>4</td>
<td>2027 (44%)</td>
<td>3597 (53%)</td>
</tr>
</tbody>
</table>

How Much Do I Know? Resident Self-assessment and the National In-training Exam

Edward Stettner, Melissa White, Robin Hemphill, and Sally Santen
Emory University, Atlanta, GA

Background: There is concern that physicians are not able to accurately assess their own abilities. They may be overconfident of their aptitude in areas in which they are weaker and underconfident in domains where they are stronger. This can be problematic for residents because they might not know where to focus their learning efforts.

Objectives: The purpose of this study was to determine the ability of emergency medicine (EM) residents to self-assess their medical knowledge and ability to perform on the American Board of Emergency Medicine (ABEM) national in-training examination.

Methods: Emergency medicine residents were asked to estimate their score both before and after taking the ABEM in-training examination in February 2010. The data were collected using de-identification codes to maintain the confidentiality of the residents. Residents were divided into thirds based on their actual in-training exam score to create groups of high, middle, and low performers. These groups were compared on their ability to assess their performance by comparing estimated scores and real scores using ANOVA and chi-square statistics.

Results: Complete data were available for 39 residents. For the most part, residents underestimated their in-training performance. The mean in-training score was 77.3, while the mean pre- and post-examination estimates were 65.9 and 65.7, respectively. There was a significant difference in the performance groups’ ability to self-assess (p<0.001). All residents in the high performance group underestimated their performance, while almost half of the low performers (46%) overestimated their actual scores (p<0.005).

Conclusion: Emergency medicine residents are unable to accurately self-assess their performance on the ABEM in-training examination. Many low performing residents overestimate their scores, and therefore may not be able to identify the areas in which they need to concentrate their studies.

A Brief Educational Intervention Is Effective in Teaching the Femoral Nerve Block Procedure to First Year Emergency Medicine Residents

Saadia Akhtar1, Ula Hwang2, Eitan Dickman3, Bret P Nelson2, R S Morrison2, and Knox H Todd1
1Beth Israel Medical Center, New York, NY; 2Mount Sinai School of Medicine, New York, NY; 3Maimonides Medical Center, New York, NY

Background: Hip fractures are a painful condition commonly encountered in the emergency department (ED). Older adults in pain often receive suboptimal doses of analgesics, particularly in crowded EDs. Nerve blocks have been used by anesthesiologists to help control pain from hip fractures post-operatively. Use of nerve stimulator and ultrasonographic guidance has increased the safety of this procedure.

Objectives: We instituted a pilot study to assess the ability of emergency medicine (EM) interns to effectively perform this procedure after a didactic and demonstration session.

Methods: Emergency medicine interns from three urban training programs underwent a one-hour didactic and hands-on training session on the femoral nerve block (FNB) procedure. A written pre-test was used to assess baseline knowledge; it was administered again (with randomized test items) at 1 and 3 months. A critical actions checklist (direct observation of procedure steps via simulated patient encounter) was assessed after the training session and again at 3 months.

Results: A total of 38 EM interns were initially evaluated: 33 successfully completed 1-month, and 3-month written test evaluations, and 30 completed all written and direct observation evaluations. Mean written pre-test scores were 66% (sd 9); post-test 92% (sd 5), 1-month 74% (sd 8), and 3-month 75% (sd 9). After initial training, 37 out of 38 residents (97%) demonstrated competency (completing ≥15 of 19 critical actions) in the FNB procedure via direct observation. At 3 months, 25 out of 30 interns (83%) continued to retain 85% of their initial critical action skills, and 3 out of 30 (10%) saw an improvement with their proficiency.
Conclusion: A one-hour training with demonstration module yielded high competency rates in performing critical actions related to the FNB; these skills were well maintained at 3 months. An ongoing study will attempt to correlate this competency with procedures performed on patients.

249 Emergency Department Information System Use and Support of Meaningful Use Criteria
Anand R. Shah1, Adam Landman2, Joshua P Metlay1, and Karin Rhodes1
1University of Pennsylvania, Philadelphia, PA; 2Brigham and Women’s Hospital, Boston, MA

Background: The Centers for Medicare and Medicaid Services created “meaningful use” objectives describing specific functionality hospital information systems must include to qualify for federal incentives.

Objectives: Since emergency department information systems (EDIS) help meet the requirements for meaningful use, we sought to describe the latest EDIS adoption rates across U.S. emergency departments (EDs) and their support for six core meaningful use criteria.

Methods: We conducted a secondary data analysis of the 2007 National Hospital Ambulatory Medical Care Survey (NHAMCS), the most recently available with EDIS data. NHAMCS provides a nationally representative sample of all U.S. ED visits. EDIS usage data were collected by interviews with hospital administrators. EDIS adoption rates were determined by a question asking whether the ED had a complete (all electronic), partial (part electronic and part paper-based), or no EDIS. Respondents are also asked about specific EDIS features, including six that are required for meaningful use: patient demographics, computerized physician order entry (CPOE), drug interaction checks, intervention reminders, public health reporting, and problem lists. Descriptive statistics were calculated using survey weights to produce unbiased, national estimates.

Results: As of 2007, 62% of U.S. EDs had some type of EDIS in place. However, less than 20% reported completely electronic systems and 38% reported no EDIS. In EDs, support for meaningful use components, included patient demographics (83%), problem lists (44%), CPOE (40%), public health reporting (33%), drug interaction checks (30%), and intervention reminders (29%). Only 6.3% of EDs supported all six core “meaningful use” features surveyed by NHAMCS.

Conclusion: In 2007 over a third of EDs did not have any EDIS and most reported incomplete systems. A majority of EDIS contain key meaningful use features. Results support the need for more alignment between hospitals and EDs to increase EDIS functionality and careful monitoring of the effect of this rapid transition on quality of care.

251 Could Patient-generated Images Be Used as a Diagnostic Aid in the Acute Care Setting?
Peter J Dowiatt, Neal K Sikka, Kabir Yadav, and Matthew Burke
The George Washington University, Washington, DC

Background: Advances in mobile phone technology and their relative low cost have placed high quality cameras in the hands of vast numbers of consumers. Market penetration is over 3.5 billion worldwide, with over 292 million US wireless subscribers. Patients can capture an image of an acute problem and transmit it to a provider. The provider could then make a visual diagnosis without having the patient come to a facility, potentially reducing emergency department (ED) and outpatient visits and decreasing health care costs.

Objectives: To determine if the quality of patient-generated mobile phone camera images of acute medical problems is adequate to make medical management decisions.

Methods: This prospective cohort study was conducted from 9/27/2010 to 11/8/2010 on a convenience sample of patients in an academic urban ED. Patients were solicited to submit images of their acute medical problems (abscesses, rashes, lacerations) captured by their mobile phone cameras and transmitted by e-mail. Two physician experts in telemedicine, blinded to clinical data, reviewed each image independently using a Likert scale and assessed if a management decision could be made solely based upon the image. Data analysis was performed using descriptive statistics and inter-rater agreement with bias-corrected bootstrapped confidence intervals.

Results: Of the 234 images acquired, the majority of images had a resolution of 3 megapixels or less (96%). The majority of images were rated good to excellent by both raters (Table 1, next page), and both raters deemed the majority of images were adequate for decision-making (85.5% and 81.6%, respectively). Cohen’s kappa was 0.52 (95% CI 0.43 - 0.61) for the quality scale and 0.49 (95% CI 0.35 - 0.62) for suitability.

Conclusion: Though image resolution was lower than anticipated, most images were rated highly and expert reviewers deemed the vast majority suitable for medical decision-making. Further research on larger databases of images is needed to determine minimum hardware and image quality standards for patient-generated mobile phone camera images, as well as their potential to reduce visits and costs.

250 Root Cause Analysis Using Daily Performance Metrics Reduces ED Length of Stay for Surgical Consultants
Steven Hornig1, Lina Pezzella2, James M. Hurst1, Richard E Wolfe1, and Larry A Nathanson1
1Beth Israel Deaconess Medical Center / Harvard Medical School, Boston, MA; 2Harvard Medical School, Boston, MA

Background: As part of a quality assurance initiative rooted to reduce emergency department (ED) length of stay (LOS) for surgical consult patients, we evaluated performance metrics to key stakeholders on a daily basis. ED and surgery leadership used these daily metrics to perform root cause analysis on surgical consult patients with increased ED LOS.

Objectives: To evaluate whether a root cause analysis driven by daily performance metrics would be effective in decreasing ED LOS for surgical consult patients.

Methods: Prospective cohort study looking at ED LOS for surgical consult patients after an e-mail intervention at a 55,000 visits/year Level I tertiary academic teaching hospital. All consecutive adult ED patients between 8/15/2010 and 10/1/2010 who received a general surgical consult were enrolled. We compared this intervention cohort to a historical cohort of patients presenting between 7/1/2010 and 8/14/2010. The primary outcome measure was ED LOS and secondary outcome measure was time to consultation. Descriptive statistics with interquartile ranges were reported for the outcome measures and significance was tested using a Wilcoxon Rank Sum test.

Results: A total of 916 patients had surgical consults placed during the study period; 459 patients presented before the intervention and 457 patients presented after the intervention. The median LOS decreased 54 minutes from 463 minutes (326-617) before the intervention to 409 minutes (294.5-528.5) after the intervention, with a two-tail p value of <0.0001. Time to consultation decreased 25 minutes from a median of 160 minutes (87–265) to 135 minutes (70–239.5), with a two-tail p value of 0.0017. There was no difference in age, sex, ESI, number of consults, or disposition. There was also no difference in median LOS for other consultation services or in previous years during the same time period.

Conclusion: Emergency department LOS and time to consultation were decreased in surgical consult patients after the initiation of daily performance metric e-mails.
Background: Potential exists to improve continuity of care for poisonings with electronic information exchange (EIE) between poison control centers (PCCs) and emergency departments (EDs). However, many EIE initiatives fail due to unanticipated barriers.

Objectives: Our objective was to identify the clinical, operational, and legal considerations important for EIE between EDs and PCCs.

Methods: We convened a panel of 71 national experts in emergency medicine, poison control, and informatics for a modified Delphi study, September - December 2010. In round one, an initial subgroup, the second round response rate = 0.77 (n=55), and additional state-

Results: Discharge-relevant findings were found in 2.2% (95% CI 1.5–3.4) of ED radiology reports, but 59% (37–77) of discharge instructions failed to note those findings. In the training set (977 reports), NLP had a sensitivity of 91% (71–99) and specificity of 100% (99–100), but in the validation set (1258 reports), only 62% (45–77) and 99% (99–100), respectively.

Conclusion: Failure to document discharge-relevant radiology findings in discharge instructions occurs frequently. NLP offers a promising error-prevention tool, but our implementation must be modified, then further validated, to ensure it can accommodate the full range of linguistic variability found in dictated radiology reports.

254 Emergency Department Patient Preferences for Technology-based Behavioral Interventions

Megan Ranney1, Esther Choo1, Andrew Baum1, Yvonne Wang1, Melissa Clark2, and Michael J Mello1

1Rhode Island Hospital/Brown University, Providence, RI; 2Brown University, Providence, RI

Background: Technology-based screening and interventions have the potential to transform our ability to address high-risk health behaviors in the emergency department (ED). No prior studies assess patient perceptions of ED technology-based behavioral interventions.

Objectives: 1) Assess ED patients’ preferences for and concerns about technology-based behavioral interventions; and 2) determine the relative prevalence of technology preferences for younger versus older ED patients.

Methods: This ongoing cross-sectional study is recruiting a systematic sample of patients from an urban academic ED (>150,000 annual visits). Inclusion criteria are age ≥13, English language, and ability to consent. Participants self-administered a standardized survey based on existing measures. Topics included demographics, current technology use, preferences for education on seven risky behaviors. When full sample size is reached, logistic regression will be performed to identify predictors of technology preferences, including reported risky behaviors.

Results: 263 participants (71% of those eligible) have completed the survey to date. Mean age was 28 yrs; 52% were female, 69%...
white, and 8% black. Overall, use of technology (computers [93%], internet [71%], social networks [71%], cell phones [96%], text messaging [84%]) was high. Technology was the most preferred format among younger patients for all topics; very few preferred printed materials such as brochures (<1–12%). Compared to older patients, younger patients more often preferred technology-based interventions for unintentional injury (61% vs 44%, p=0.017), community violence (62% vs 47%, p=0.042), partner violence (60% vs 44%, p=0.035), and drug and alcohol use (44% vs 23%, p=0.016). Younger patients were less likely to cite barriers to using technology, such as lack of access (p=0.017), complexity (p=0.045), or time commitment (p=0.031).

**Conclusion:** Younger ED patients prefer technology-based interventions for a wide variety of behavioral health topics. Non-traditional media may be most appropriate for delivering health messages to this target ED population.

(Originally Submitted as a “Late-breaker”)

### 255 Can Software Automation Improve Resident Procedure Tracking?

**Thomas S Seufert, Patricia M Mitchell, Kerry K McCabe, Allison R Wilcox, and Jeffrey I Schneider**

**Boston Medical Center, Boston University School of Medicine, Boston, MA**

**Background:** Tracking resident procedural experience is challenging for residency programs, and is a frequent source of Residency Review Committee (RRC) citations. Hand-written, web-based, and PDA-based systems have been used to log procedures, but success and compliance has remained poor.

**Objectives:** To evaluate the effect of a procedure logging system that directly exports procedures from the electronic medical record (EMR) to New Innovations (NI), a residency management software package widely used by emergency medicine (EM) residency programs to track resident procedures. Resident compliance with the system was also assessed.

**Methods:** This was a pre/post study conducted at an urban academic medical center (annual emergency department [ED] volume of 130,000) with a 4-year EM residency program. Software was developed to search for and abstract resident procedures documented in the EMR and automatically export them into NI. The documentation of procedures was compared for two 2-month periods: 10/01/09 to 11/30/09 (pre-automation) and 10/01/10 to 11/30/10 (post-automation). A computer-generated random sample of EMRs from the pre and post time periods was assessed for completeness and accuracy of data transfer, including date, medical record number, resident, and procedure type. Individual resident utilization of the system was monitored.

**Results:** The automated system increased the daily average number of procedures logged by 124% (13.9 vs 31.1). The automated logs had more complete data recorded (34% vs 100%), and more accurately recorded information (92% vs 98%). Most residents (35/39, 90%) working in the ED during the study period used the system to log at least 90% of procedures.

**Conclusion:** Automated transfer of procedures from EMR to NI was more complete, more accurate, and resulted in a significant increase in procedures logged. This innovative system improved surveillance of required procedures and helped our assessment of ACGME patient care and practice-based learning competencies for individual residents. Other residency programs might benefit from a similar system.
and forgot to turn it on in 7 (1.7%), 114/393 (29.0%) cases or 505 hours of patient encounters were reviewed. 108 (94.7%) cases contained video showing the patient during the physical exam portion of the encounter and sound recording of the patient’s interview by the physician. Three (2.6%) had sound but no video, and 3 (2.6%) patients had neither the sound nor video of their key portions of the encounter recorded.

Conclusion: The use of POVVR results in video recordings of the patient’s physical exam and audio recording of the initial patient interview. It appears feasible for use in documenting patient encounters.

Methods: We followed a prospective, consecutive cohort of emergency department patients who received intravenous contrast for CECT for the outcome of death from any cause within 1 year. At enrollment, we also collected data including other predictors of mortality: active malignancy, coronary artery disease (CAD), congestive heart failure (CHF), and age ≥70 years. Serum creatinine was measured at enrollment and within 2–7 days of contrast administration to determine the outcome of CIN: an increase of >0.5 mg/dL or ≥25% of baseline. Proportional hazard ratios (HRs) were calculated using a Cox regression survival analysis for CIN and other predictors of mortality. Anticipating that deaths attributable to terminal cancers would account for the majority of deaths observed within a population undergoing imaging studies, we also performed a separate analysis of the subset of patients without a history of active malignancy at the time of enrollment.

Results: We followed 633 patients and 46 died (7%, 95% CI: 5.9–9.0%) within 1 year. The incidence of CIN was 11% (95% CI 8–14%). The proportions of patients with active malignancies, CAD, CHF and age ≥70 years were 8% (95% CI 6–11%), 7% (95% CI 5–10), 5% (95% CI 3–7%), and 8% (95% CI 6–11%), respectively. Active malignancy (HR 9.2, 95% CI 5.1–16.8), CIN (HR 2.4, 95% CI 1.3–4.6), CHF (HR 2.1, 95% CI 1.0–4.2), CAD (HR 2.2, 95% CI 1.0–5.5) and age ≥70 years (HR 1.8, 95% CI 1.0–3.8) were significant predictors of all-cause mortality. Among patients without active malignancies, the mortality rate was 4% (25/580, 95% CI 3.6%) and CIN (HR 4.0, 95% CI 1.7–9.6) and age ≥70 years (HR 3.7, 95% CI 1.4–9.7) were significantly associated with death, whereas CAD (HR 2.5, 95% CI 0.8–7.7) and CHF (HR 1.8, 95% CI 0.6–5.3) were not.

Conclusion: The development of CIN following CECT is associated with a significant likelihood of death at 1 year among patients with and without active malignancies. This relationship is comparable to other well-known predictors of mortality including active malignancy, CAD, CHF, and age ≥70 years.

Background: The ERDBA database contains data representing over 10 million visits per year. Member hospitals submit operational data to the organization on a yearly basis. The ERDBA database contains data representing over 10 million ED visits.

Objectives: To compare ED computed tomography (CT) scan and x-ray usage during the years 2005–2008 using the ERDBA database.

Methods: A retrospective analytic cohort study examining selected data points from the ERDBA database was conducted. Data from 2004–2008 were included in this study. Both CT scans per 100 patients and x-rays per 100 patients were compared during the course of the studied years using analysis of variance (ANOVA). A p-value ≤ 0.05 was considered significant.

Results: No statistically significant change in the number of CT scans performed per 100 patients was observed between the years 2005, 2006, 2007, and 2008, with emergency departments (EDs) ranging in size from under 25,000 to over 100,000 visits per year. Member hospitals submit operational data to the organization on a yearly basis. The ERDBA database contains data representing over 10 million ED visits.

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Sonographic Elastography Predicts Failure of Therapy for Skin Abscesses
Romolo Gaspari, Matthew Dayno, and Justin Briones
University of Massachusetts Medical School, Worcester, MA

Atraumatic Headache

Statistics by Group with Group Demographics

<table>
<thead>
<tr>
<th></th>
<th>Atraumatic Headache Group (n = 225)</th>
<th>Head Trauma Group (n = 260)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>70.7% female 29.3% male</td>
<td>59.2% female 40.8% male</td>
<td>0.01*</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>43.2 (18.5) 40.5 (21.1)</td>
<td>61 (48 + 13)</td>
<td>0.14^</td>
</tr>
<tr>
<td>Positive for sinusitis findings (chronic sinusitis + indeterminate)</td>
<td>63 (51 + 12) 61 (48 + 13)</td>
<td>199</td>
<td>0.30*</td>
</tr>
<tr>
<td>Negative for sinusitis findings</td>
<td>162</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A chi-square test was used to determine statistically significant differences.
^An independent t-test was used to determine statistically significant differences.

Conclusion: Measurements of abscess induration with sonographic elastography are associated with failure of therapy. Imaging an abscess with sonographic elastography may predict which abscess cavity will fail therapy.

262 Radiation Exposure From Diagnostic Imaging: Emergency Physician Education, Knowledge, and Practice
Elaine Rabin and Swathi Nadindla
Mount Sinai School of Medicine, New York, NY

Background: The rapid rise in use of diagnostic imaging with radiation has raised concerns about the related risks. Studies from abroad show that physicians ordering these tests often lack understanding of the radiation involved. Little is known about American emergency physicians’ (EPs) education and knowledge of radiation risks.

Objectives: To assess 1) EPs’ knowledge of radiation exposure due to diagnostic imaging and its risks, 2) EP education on this topic, and 3) how knowledge affects practice.

Methods: A survey was designed to elicit EPs’ history of formal education on imaging-related radiation and its risks, to assess the frequency with which EPs consider and explain the risks when ordering CT scans, and to test EPs’ knowledge of the topic. The survey was piloted, revised, and administered to a convenience sample of EPs at a national conference in October 2010. Descriptive statistics and correlation analyses were performed on the data.

Results: Respondents (n=832) reported a range of experience (36% 20 yr) and practice settings (48% academic, 41% community, 10% both). 83% see pediatric and adult patients. 64% had formal radiation education (decreased with more years of practice 71% to 58%, p=0.015): 21% in medical school, 31% in residency, and 20% via CME. For adult patients, EPs with formal education were significantly more likely to consider radiation risks (62% vs 49%, p=0.000) and advise patients of them (50% vs 37%, p=0.000) always or often before ordering CT scans; for pediatric patients, 88% vs 83% (p=0.067) considered and 81% vs 74% (p=0.013) advised of the risks. Formal education did not lead to significant differences in correct answers to test questions. Overall, 31% correctly put four items (CT abdomen/pelvis, annual atmospheric radiation, CT head, chest X-ray) in ascending order of radiation. The following percent correct: 21% in medical school, 61% in residency, and 31% via CME. For adult patients, EPs with formal education were significantly more likely to consider radiation risks (62% vs 49%, p=0.000) and advise patients of them (50% vs 37%, p=0.000) always or often before ordering CT scans; for pediatric patients, 88% vs 83% (p=0.067) considered and 81% vs 74% (p=0.013) advised of the risks. Formal education did not lead to significant differences in correct answers to test questions. Overall, 31% correctly put four items (CT abdomen/pelvis, annual atmospheric radiation, CT head, chest X-ray) in ascending order of radiation. The following percent correct: 21% in medical school, 61% in residency, and 31% via CME.

Conclusion: Most EPs lack basic knowledge about the radiation involved in diagnostic tests, both under- and over-estimating doses. Risks of radiation are considered much more frequently in decision-making for pediatric patients compared to adults. Formal education on the topic is inconsistent but has increased, although in our study, it did not improve knowledge.
The Effect of Patient Positioning on Ultrasound Assessment of the Inferior Vena Cava
Nova Panebianco1, Alfred B Cheng1, Jonathan Fischer1, Maite Huis In’t Veld2, Felicita M Daukaus1, Asako C Matsuura1, and Anthony J Dean1
1University of Pennsylvania, Philadelphia, PA; 2Erasmus Medical Center, Rotterdam, Netherlands

Background: Ultrasound measurement of the inferior vena cava diameter (IVC-D) and collapse index (CI) to assess intravascular volume has traditionally been performed on supine patients. Emergency department (ED) patients are often unable to tolerate supine positioning. It is unknown whether sitting position affects IVC metrics. 

Objectives: We hypothesized that the supine vs. sitting position would have no effect on IVC-D or CI. 

Methods: This was a prospective observational convenience sample of patients in an inpatient dialysis center at an urban academic medical center. This patient population has been used in prior ED IVC-D studies because of their high prevalence of intravascular volume derangements. All measurements were pre-dialysis. Patients ≥18 yrs with the ability to consent were eligible. Studies were performed by two emergency ultrasound (EUS) fellows and one EUS fellowship-trained attending. Patient demographics, vitals, medical history, and admission diagnosis were recorded. Maximum and minimum IVC-D and CI were measured using M-Mode in the longitudinal plane with patients supine and at 45%. Results were compared using t-test and Wilcoxon signed rank sum test as appropriate. 

Results: 35 patients were enrolled (56 years old ±12.5, 63% male, 74% black). No differences were observed based on patient positioning at 45° vs supine for IVC max (t = -0.50, p= 0.62), min (t= -0.40, p= 0.69), or CI (t= -3.5, p= 0.95). 

Conclusion: In this patient population, there was no difference in IVC metrics based on patient position. For those patients who cannot tolerate a supine position during IVC ultrasound, one may consider performing the exam in a semi-recumbent position. (Originally Submitted as a “Late-breaker”)

<table>
<thead>
<tr>
<th>IVC Position</th>
<th>Mean (SD)</th>
<th>Median [Interquartile Range]</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Supine</td>
<td>18.3 (8.2)</td>
<td>18.6 [12.0–22.0]</td>
<td>0.62</td>
</tr>
<tr>
<td>45°</td>
<td>18.6 (7.2)</td>
<td>18.9 [12.6–22.0]</td>
<td></td>
</tr>
<tr>
<td>Min Supine</td>
<td>13.0 (8.5)</td>
<td>13.5 [6.0–18.1]</td>
<td>0.69</td>
</tr>
<tr>
<td>45°</td>
<td>13.3 (8.4)</td>
<td>13.5 [5.1–19.9]</td>
<td></td>
</tr>
<tr>
<td>CI Supine</td>
<td>34.5 (26.1)</td>
<td>26.8 [10.6–56.3]</td>
<td>0.95</td>
</tr>
<tr>
<td>45°</td>
<td>34.5 (25.3)</td>
<td>25.3 [11.9–53.2]</td>
<td></td>
</tr>
</tbody>
</table>

Real-time Video-streaming of Ultrasound Clips Using Domestic Internet Networks and Free Videoconferencing Software
Andrew S Liteplo1, Vicki E Noble1, and Ben Attwood2
1Massachusetts General Hospital, Boston, MA; 2John Radcliffe Hospital, Oxford, United Kingdom

Background: Use of point-of-care ultrasound for the rapid diagnosis of acute conditions in prehospital and remote environments is increasing. As ultrasound becomes more prevalent in non-traditional settings, training of providers has been a challenge. In some situations, when an expert is not available at the point of care, there may be an advantage in transmitting ultrasound images from the point of care to an experienced interpreter in real time, for immediate over-reading and feedback.

Objectives: 1) To assess the feasibility of using familiar, widespread, and cost-effective technology to allow real-time remote over-reading of ultrasound images. 2) To compare the feasibility of four different methods of communication and transmission (iChat vs Skype when transmitted via wireless Internet [’WiFi’] and 3G networks) and to determine which method provided the best quality image.

Methods: An ultrasound machine was connected to a laptop computer through a digital video converter. This was connected to the internet via WiFi, and a series of five ultrasound clips were sent, first through iChat, then through Skype. This was repeated using a 3G connection. A receiving computer in a remote location was connected to the internet via WiFi and recorded the video clips. All video clips, including the original, were then reviewed by eight emergency physicians with training in emergency ultrasound who were blinded to the method of transmission, and scored on a 10-point Likert scale on image quality, resolution, and detail. The scores were then compared using a Student’s t-test.

Results: Transmission was feasible by all methods except when iChat was used over a 3G connection. Image quality (as percent of score of the original clip) was highest when iChat was used via WiFi (90.7 +/- 4.1%), followed by Skype via WiFi (82.0 +/- 5.0%), and worst when Skype was connected via 3G (57.5 +/- 8.1%). iChat-WiFi was statistically superior to Skype-3G (p=0.028), as was Skype-WiFi (p=0.028). When transmitted via WiFi, iChat scans? 2. Are health care providers in the ED discussing radiation risks associated with CT scans with patients prior to ordering CT scans? 3. Does patient level of education affect knowledge about the radiation exposure and cancer risks associated with CT scans? 4. Do patients want to know about possible radiation risks associated with CT scans?

Methods: We conducted a survey of clinically stable patients in the ED undergoing CT after the scan had been performed.

Results: Two hundred patients were surveyed. Eighty-two (41%) were aware that CT scans are associated with radiation exposure. Fifty (25%) patients were aware that radiation from CT can increase overall lifetime risk of cancer compared with 2/77 (2.6%) in a similar study conducted in 2004 (Lee). Twenty-nine (14.5%) providers specifically discussed radiation risk with patients prior to the CT compared with only 1/77 (1.3%) in 2004. Education levels were evenly distributed from some high school through postgraduate study. There was a significant trend towards knowledge that CT uses x-rays among those with more education (56% of those with some high school versus 83% of those with a college degree and 75% of those with a postgraduate degree - Cochran-Armitage test for trend: p = 0.0217). However, there was no association between level of education and knowledge of cancer risk associated with radiation risk from CT. Eighty-two (41%) would have liked more information regarding radiation risks from the provider.

Conclusion: ED patient knowledge has increased significantly over the past 6 years. At the same time, ED providers are more commonly discussing these risks. Level of education is associated with knowledge that CT uses x-rays, but not with knowledge that this is associated with a greater risk of cancer. Patients want to be informed.

Emergency Department Patient Knowledge and Physician Communication Regarding Computed Tomography (CT) Scans
Michael Zwank1, Marissa Leow2, and Christopher P Anderson3
1Regions Hospital, Saint Paul, MN; 2Macalester College, Saint Paul, MN; 3Healthpartners Research Foundation, Bloomington, MN

Background: Computed tomography (CT) is being utilized very commonly in the emergency department (ED). CT is associated with radiation doses that can increase the overall lifetime risk for cancer. Based on prior literature, very few patients are aware of these risks (Lee, 2004). However, numerous recent articles in medical journals have been published highlighting the risks and these articles have been reported in the lay press.

Objectives: To determine: 1. Has the recent attention in both the medical literature and lay press increased public knowledge about the radiation exposure and cancer risks associated with CT scans? 2. Are health care providers in the ED discussing radiation risks associated with CT scans with patients prior to ordering CT scans? 3. Does patient level of education affect knowledge about the radiation exposure and cancer risks associated with CT scans? 4. Do patients want to know about possible radiation risks associated with CT scans?

Methods: We conducted a survey of clinically stable patients in the ED undergoing CT after the scan had been performed.

Results: Two hundred patients were surveyed. Eighty-two (41%) were aware that CT scans are associated with radiation exposure. Fifty (25%) patients were aware that radiation from CT can increase overall lifetime risk of cancer compared with 2/77 (2.6%) in a similar study conducted in 2004 (Lee). Twenty-nine (14.5%) providers specifically discussed radiation risk with patients prior to the CT compared with only 1/77 (1.3%) in 2004. Education levels were evenly distributed from some high school through postgraduate study. There was a significant trend towards knowledge that CT uses x-rays among those with more education (56% of those with some high school versus 83% of those with a college degree and 75% of those with a postgraduate degree - Cochran-Armitage test for trend: p = 0.0217). However, there was no association between level of education and knowledge of cancer risk associated with radiation risk from CT. Eighty-two (41%) would have liked more information regarding radiation risks from the provider.

Conclusion: ED patient knowledge has increased significantly over the past 6 years. At the same time, ED providers are more commonly discussing these risks. Level of education is associated with knowledge that CT uses x-rays, but not with knowledge that this is associated with a greater risk of cancer. Patients want to be informed.
was superior to Skype, but not statistically significantly so (p=0.03).

Conclusion: Wireless transmission of ultrasound video clips using inexpensive hardware, free videoconferencing software, and domestic internet networks is feasible with retention of image quality sufficient for interpretation. WiFi transmission results in greater image quality than transmission by a 3G network.

266 Comparison of Arterial or Venous and Capillary Lactate Levels in Patients With Suspected Sepsis

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Background: The determination of serum lactate levels in patients with suspected sepsis has been used to support the diagnosis, evaluate severity of disease, guide early goal-directed therapy, and evaluate response to treatment. Measurement of serum lactate is frequently delayed until after the patient has been evaluated by a physician, prolonging the time to identification and treatment of patients with significant illness.

Objectives: The objective of this study was to determine whether finger stick lactate can be used as a reliable and acceptable alternative to arterial or venous lactate based upon the correlation between capillary lactate levels and arterial or venous levels in a point-of-care testing system.

Methods: Seventy-five patients presenting to the emergency department with suspected infection based on clinical judgment and at least two out of four systemic inflammatory response syndrome (SIRS) criteria, undergoing arterial and/or venous lactate analysis as part of routine care, had a simultaneous capillary serum lactate sample drawn for comparison. Serum lactate levels from all samples were determined using the i-STAT 1 handheld point-of-care system. Descriptive statistics, including mean difference (an indicator of accuracy) and correlation coefficient (an indicator of reliability) were calculated.

Results: With 54 patients enrolled, preliminary results demonstrate a mean difference between arterial or venous and capillary serum lactate of 0.33 mmol/L (95% CI -2.7 to +2.1 mmol/L) with good correlation noted between arterial or venous and capillary lactate measurements (r=0.70).

Conclusion: Finger stick lactate can be used as a rapid triage screening measure for determining the need for initiation of early goal-directed therapy in patients with suspected sepsis. (Originally Submitted as a “Late-breaker”)

267 Rates of DVT Among PE Positive and PE Negative Patients Diagnosed by CT Angiography With Lower Extremity Follow-through in Two Emergency Departments: 1/2006 - 12/2009

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Background: Some emergency departments (EDs) include lower extremity IV contrast run-offs to look for deep venous thrombosis (DVT) during a pulmonary embolus (PE) protocol CT scan.

Objectives: The purpose of this study was to determine rates of DVT among patients who had a PE protocol chest CT with run-offs. Secondarily, we correlated the location of PE and the presence of a concurrent DVT.

Methods: Retrospective chart review of all patients presenting to two EDs from 1/06-12/09 who were investigated for venous thromboembolism (VTE) with a PE-protocol CT with run-offs. Each radiology report was stratified by the presence of main, segmental, or sub-segmental PE, along with the presence or absence of DVT. We first calculated the proportion of PE studies that were negative for PE and positive for DVT. We then assessed the proportion of CTs that were positive for PE and DVT, and if this differed by the location of the PE using a Fisher’s exact test.

Results: A total of 5,620 CTs were performed, and 428 (7.6%) were positive for venous thromboembolism (VTE). Of these, 84 (19.6%) were negative for PE, but were positive for DVT. Of 344 diagnosed PEs, 71 (20.6%) had both a PE and DVT. In 344 PEs diagnosed, 63 were in the main pulmonary, 236 were segmental, and 24 were sub-segmental. Concurrent DVTs were found in 31.3% of main pulmonary, 18.2% of segmental, and 8.3% of sub-segmental PEs (p=0.01). Sixty-three percent of patients were female, the average age was 51.0, 17.6% were Caucasian, and 72.4% were African American.

Conclusion: In this sample of patients being evaluated for VTE, there would have been a 20% miss rate if lower extremity run-offs had not been used. This suggests that lower extremity run-offs have a relatively high diagnostic yield. There was a lower rate of concurrent DVT in segmental and sub-segmental PEs, suggesting a lower overall clot burden in more distal PEs. However, while sub-segmental PEs may be at lower risk for recurrent PE given the lower risk of lower extremity clot burden, the presence of DVT in almost 1 in 10 of these patients suggests that diagnosing sub-segmental PE is clinically significant.

268 Abscess Volume and Ultrasonographic Findings Cannot Distinguish CA-MRSA Skin Abscess From Other Infecting Organisms

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Background: Methicillin-resistant Staphylococcus aureus (MRSA), the most common cause of skin abscesses, has been associated with greater purulence and inflammation. Emergency department (ED) ultrasonography (EUS) is commonly used for abscess detection; the association of EUS findings with infecting organism has not been studied.

Objectives: To determine if EUS findings from ED skin abscesses can predict MRSA infection.

Methods: Secondary analysis of prospectively enrolled subjects with skin abscess diagnosed in the ED via EUS. Children 2 mo-19 yrs presenting to the ED for a skin abscess, who had an abscess culture obtained, were included. Subjects with a prior drainage procedure, multiple infections, or incomplete EUS measurements were excluded. EUS were performed by trained pediatric ED physicians. EUS details were recorded, including abscess cavity measurements in the x, y, and z planes, and signs of local inflammation (intracavitary gas, lobulation, hyperechoic or thickened dermis). Abscess volume was calculated using the ellipsoid formula: \( 4/3 \pi \times \frac{x}{2} \times \frac{y}{2} \times \frac{z}{2} \). Therapeutic decisions, including obtaining cultures, were at the discretion of the treating ED physician, who was blinded to EUS results.

Results: 188 subjects met inclusion criteria. Mean age was 7.7 +/- 6.2 years; 39.9% were male, and 72.7% African American. Abscesses were primarily located in the gluteal/perineal region (33.0%) or lower extremity (29.3%), and were present for a mean 4.2 days (95% CI 3.8-4.6). Spontaneous drainage was present in 26.7% of lesions. MRSA was isolated in 125 (66.5%) abscesses; methicillin-sensitive S. aureus (21.8%) was most common among non-MRSA lesions. EUS findings included abscess volume of 1.12 mm\(^3\) in MRSA compared with 2.46 mm\(^3\) in non-MRSA lesions (mean difference 1.33 mm\(^3\), 95% CI 0.47 to 2.21). No significant differences were present between MRSA and non-MRSA lesions with...
Background: Several studies have suggested that measurement of optic nerve sheath diameter (ONSD) by non-invasive ocular ultrasound can predict elevated intracranial pressure (ICP) as measured by invasive monitoring or as suggested by CT findings.

Objectives: We sought to investigate the correlation between ONSD and invasively measured ICP, and ONSD and mortality, in patients with head trauma or intracranial hemorrhage.

Methods: We prospectively enrolled trauma and neurosurgical ICU patients who had received intraventricular or intraparenchymal catheters as part of their standard ICU care. Investigators who were blind to current ICP readings performed ocular sonograms and measured ONSD both vertically and horizontally. ICP measurements were recorded immediately after each sonogram was performed or as suggested by CT findings.

Results: Thirty-seven patients with ICP monitors were enrolled. Twenty-nine patients had ONSD measured concurrently with an ICP measurement. Correlation between ONSD and invasively measured ICP, and ONSD and mortality, in patients with head trauma or intracranial hemorrhage.

Conclusion: We sought to investigate the correlation between ONSD and invasively measured ICP, and ONSD and mortality, in patients with head trauma or intracranial hemorrhage. Thirty-one patients had one or more ONSD measurements done concurrently with an ICP measurement. Correlation between ONSD and invasively measured ICP was 0.49 (95% CI 0.32–0.63), and between ONSD and mortality was 0.45 (95% CI 0.28–0.63). The differences, while statistically significant, may be too small to be clinically significant or useful.

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Background: The use of ultrasound to diagnose kidney stones has been well studied in the radiology literature. There is no systematic review of the emergency department (ED) experience with ultrasonography for diagnosing nephrolithiasis. The goal of this study is to summarize the existing literature.

Objectives: We reviewed systematically the literature for the operating characteristics of ED ultrasonography for kidney stones.

Methods: We searched Pubmed and EMBASE databases for randomized controlled trials from 1965 through November 2010 using a search strategy derived from the following PICO formulation of our clinical question: Patients: patients (18+ years) suspected of having a kidney stone. Intervention: bedside ED ultrasonography to detect hydronephrosis or calculi. Comparator: standard for kidney stones was either a non-enhanced computed tomography (CT) or intravenous pyelography (IVP). Outcome: operating characteristics (sensitivity, specificity, predictive values, and likelihood ratios) of ED renal ultrasonography were analyzed using a forest plot (95% CI calculated by Review Manager version 5.0 (Revman 5.0). Qualitative methods were used to summarize the study results.

Results: Our initial search strategy identified 546 articles; 462 were excluded by relevance of title or abstract, 47 by not being in the ED, 25 with no kidney stone, 10 retrospective. This left two studies with 108 and 83 patients, respectively. Sensitivity 90% - 72%, specificity 59% - 73%, PPV 72% - 58%, NPV 28% - 42%, LR+ 2.12 - 2.67, LR- 0.17 - 0.38. The heterogeneity between the two studies can be explained by the studies’ small sample sizes and variability in operator ultrasonographic experience.

Conclusion: We identified two high quality studies of the operating characteristics of ED ultrasonography for kidney stones.

Methods: Prospective, observational trial at an urban, academic, adult ED with an annual census >100,000. Included patients were clinically suspected of normovolemia or hypovolemia. Excluded patients were <18 years old, pregnant, incarcerated, sustained significant trauma, or unable to consent. Supine IVC diameter was measured by bedside sonography using a phased array probe (M-Turbo; Sonosite, Bothwell, WA) at 3 cm from the right atrial border on maximum expiration and minimum inspiration. The caval index was calculated using the equation: caval index = (expiratory IVC diameter - inspiratory IVC diameter) x 100. The caval index measurement was repeated after a 4 minute passive leg raise (PLR). Fluid responsiveness was defined as an increase in the cardiac index by >10% by impedance cardiography (BioZ, Sonosite, Bothwell, WA). Using prior estimates of expected correlation, α=0.05, and β=0.8, we estimated a sample size of 30. The primary outcome was analyzed using Spearman correlations for non-parametric data and AUROC by Wilcoxon method.

Results: Thirty patients were enrolled; 4 were excluded due to incomplete data collection. 31% (95% CI 13–48) of the patients were fluid responders. The mean initial caval and cardiac index were 15.8 (95% CI 9.5–22%) and 2.9 (95% CI 2.6–3.2), respectively. After PLR the mean increase in cardiac index was 1.1% ± 21. The caval index did not predict fluid responsiveness (ROC=0.46, 95% CI 0.21–0.71, p=0.63).

Conclusion: Bedside sonographic measurement of IVC caval index does not predict fluid responsiveness in a heterogeneous ED patient population. Further research in targeted patient subsets, such as severe sepsis and septic shock, is needed.
272 High Accuracy of Ultrasound Images of the Supraclavicular Brachial Plexus by Novice Sonographers After Limited Training
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NYU School of Medicine, New York, NY

Background: Management of upper extremity injuries using ultrasound-guided (UG) supraclavicular brachial plexus (SCBP) nerve blocks is described in the emergency medicine literature. UG SCBP blocks are fast, safe, and effective, and avoid certain risks inherent in procedural sedation. UG SCBP blocks are performed by experienced physician sonographers.

Objectives: To determine the training needed to acquire and interpret SCBP sonographic images, a necessary first step in the performance of SCBP blocks.

Methods: Six medical students, with no ultrasound experience, participated in the study. Didactic education was provided via two one-hour instructional sessions: students reviewed ultrasound (US) machine use, US scanning techniques, and US anatomy of the SCBP. Two videos of patients receiving SCBP blocks were also viewed. After initial didactic education, students trained in the emergency department, performing US of the SCBP on 50–70 patients. During clinical training, brief review of student’s SCBP US images (every 10–15 patients) was given. On completion of clinical training, students independently recorded US images of SCBP anatomy on 43–116 patients with no oversight. Students labeled relevant structures of each SCBP image. Gel-to-image times and anticipated scan difficulty (Likert scale) were recorded. An experienced, RDMSC-certified emergency physician evaluated performance of SCBP blocks. SCBP blocks reviewed all images and determined if the image quality was acceptable for performing a SCBP nerve block. A kappa calculation is pending image review by another expert physician in UG SCBP blocks.

Results: 469 SCBP images were collected. 95% (447) [95% CI 93–96.9%] were found to be accurate and an acceptable starting point for ultrasound-guided SCBP blocks. The range of accuracy for each of the six students was 92.5%–97.8%. The average gel-to-image time among all students was 42 seconds (standard deviation = 52 sec). No association was found between the student’s anticipated level of difficulty and the ability to acquire an acceptable image or identify relevant landmarks.

Conclusion: Novice sonographers with no prior US experience can acquire accurate SCBP images (with relevant landmarks) needed for the SCBP block following limited training. Subjective perceptions of anticipated sonographic difficulty were not associated with the rate of performing an acceptable US image.

273 A Structured FAST Exam Competency Assessment Tool Versus Experience Level in Novice Users to Assess Technical Competency
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Background: Bedside ultrasound (US) is a skill integral to the practice of emergency medicine, and is highly user-dependent. Current US guidelines recommend >25 proctored studies as a marker of competency. No prior studies have used a structured competency assessment tool to evaluate the skill of image acquisition. Using published US guidelines and consensus expert opinion, we developed a FAST US competency assessment tool (FCAT).

Objectives: Using FCAT, we sought to determine the effects of varying experience thresholds on novice user improvement in FAST exam image acquisition.

Methods: This was a pre-experimental before/after study. Novice US users completing an introductory US rotation were evaluated using FCAT. All users had both a pre and post rotation evaluation. Overall study competency and image quality of five required views were rated on a five-point scale (1-poor, 2-fair, 3-good, 4-good, 5-excellent), with explicit definitions for each rating. These measures were combined to form a 30-point scale for study image quality. Each study had 27 TF (correct/incorrect), 19 AS (identified/not identified), and 13 PS (identified/not identified), assessed as binary variables. All US performed during the rotation were logged using standardized data sheets, and all studies were performed under the direct supervision or reviewed by a faculty member. Data were analyzed using descriptive statistics and 95% CI.

Results: A total of 18 novice users completed the US rotation and pre and post FCAT tests. Three users completed 0–5 US, three users completed 6–10 US, three users completed 11–15 US, three users completed 16–20 US, three users completed 21–25 US, and three users completed ≥ 25 US. Results are reported in Table 1 as mean (95% CI). All users showed similar significant improvement in overall competency, image quality, and identification of AS, regardless of experience level. All users’ overall ratings improved to 5-excellent, regardless of experience level.

Conclusion: Using a structured competency assessment tool, all novice users showed significant and similar improvement in FAST exam technical skills regardless of total number of US performed while completing an introductory US rotation. This study questions the use of experience as a marker of competency alone.

274 A New Method for Diagnosing Nasal Bone Fracture in the Emergency Department
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Background: The nasal bone is frequently involved in craniofacial trauma. Most patients present to the emergency department with overt nasal swelling. Conventional radiological examinations are usually unreliable. We introduced conductor-assisted nasal sonography (CANS) for the rapid assessment of nasal trauma.

Objectives: We sought to investigate the role of CANS in patients with nasal trauma.

Table 1

<table>
<thead>
<tr>
<th>Experience Level # US performed</th>
<th>Mean Pre-test Score (6–30)</th>
<th>Mean Post-Test Score (6–30)</th>
<th>Pre-test Rating (1–5)</th>
<th>Overall Rating (1–5)</th>
<th>Post-test Overall Rating (1–5)</th>
<th>Pre-test AS Identified (0–19)</th>
<th>Post-test AS Identified (0–19)</th>
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<tr>
<td>0 to 5</td>
<td>16 (14.1, 17.9)</td>
<td>28.7 (28, 29.4)</td>
<td>2.5 (2.3)</td>
<td>5 (5, 5)</td>
<td>9.6 (5.6, 13.6)</td>
<td>17.7 (16.19)</td>
<td></td>
</tr>
<tr>
<td>6 to 10</td>
<td>16.7 (12.4, 21)</td>
<td>29.6 (29, 30)</td>
<td>3 (1.8, 4.2)</td>
<td>5 (5, 5)</td>
<td>11.3 (8.5, 14.1)</td>
<td>16.7 (14.19)</td>
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<tr>
<td>11 to 15</td>
<td>21 (17.6, 24.4)</td>
<td>29.3 (28.7, 30)</td>
<td>3.3 (3.4)</td>
<td>5 (5, 5)</td>
<td>11 (9.9, 12.1)</td>
<td>17.7 (16.19)</td>
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<td>16 to 20</td>
<td>18.7 (16.4, 23)</td>
<td>29.6 (29, 30)</td>
<td>3.3 (3.4)</td>
<td>5 (5, 5)</td>
<td>13.6 (8.3, 10.9)</td>
<td>18 (17.19)</td>
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<tr>
<td>21 to 25</td>
<td>21.7 (15.2, 22.2)</td>
<td>29.6 (29, 30)</td>
<td>3.3 (3.4)</td>
<td>5 (5, 5)</td>
<td>13.3 (8.2, 18.4)</td>
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<td>&gt;25</td>
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<td>30 (30,30)</td>
<td>4 (3.5)</td>
<td>5 (5, 5)</td>
<td>15.3 (12.5, 18.1)</td>
<td>18.7 (18,19)</td>
<td></td>
</tr>
</tbody>
</table>
Methods: 137 patients sustaining midfacial trauma who underwent CANS examination with simultaneous facial CT scans were reviewed. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of nasal bone fracture identified by CANS and other plain films, versus nasal bone fracture evidenced by CT scan, taken as the gold standard, were measured.

Results: Of these patients (104 males and 38 females; mean age, 41±17.8 years), 104/142 were diagnosed with nasal fractures by facial CT scans. No demographic difference was found in the fracture and non-fracture groups. In addition to nasal sonography and facial CT scan, 46 patients also received nasal x-ray examination, 34 experienced skull x-rays and 24 underwent Waters’ view survey. The sensitivity, specificity, PPV, and NPV of nasal x-ray were 89%, 25%, 85%, and 33%. The skull x-ray showed a poor sensitivity of 50%, with 100% specificity, 100% PPV, and 30% NPV. The Waters’ view survey gave the worst sensitivity of 13% and a high specificity of 100%, with a PPV of 100% and a NPV of 36%. CANS proved to be the most reliable in detection of nasal fracture, with 100% sensitivity and 89% specificity, 96% PPV, and 100% NPV.

Conclusion: Our new technique could detect nasal bone fracture more accurately compared to conventional methods. We recommend it as a new standard of diagnostic tool for nasal fracture.

275 Soft Tissue Ultrasound Is as Accurate as CT for Skin and Soft Tissue Abscess Evaluation
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Background: Both bedside ultrasound (US) and computerized tomography (CT) are used to evaluate suspected skin and soft tissue abscesses but a direct comparison of the two imaging techniques has not been published. CT is considered the gold standard in imaging abscesses but CT involves exposure to radiation and US does not.

Objectives: Our objective is to determine if US and CT are equally accurate in detecting skin abscesses.

Methods: This is a retrospective observational trial of patients presenting with a suspected skin abscess over a 2-year period. Patients presenting to the emergency department who underwent both CT and bedside US imaging for a suspected skin infection were included. Patients with incomplete image sets (CT or US) were excluded. Emergency department physicians with varying level of skills obtained bedside US images. Physicians with experience in soft tissue US performed image interpretation blinded to CT findings. For the purpose of this study, both CT and US were interpreted only for the presence or absence of an abscess cavity. Definitive diagnosis of an abscess was defined by surgical evacuation of purulent material. Data are presented as mean (95% confidence interval).

Results: Over an 18 month period, 612 patients received a soft tissue bedside US with 68 of those patients receiving a CT for the same complaint. The location imaged was torso (29.4%), head and neck (26.5%), lower extremity (22.1%), upper extremity (10.3%), buttock (8.8%), and hand (3%). 44% of patients imaged by both modalities had an abscess. Overall CT was 72% (67.5-82%) sensitive and 95% (86.6-98.5%) specific and US was 90% (84-98%) sensitive and 85% (81.9-91%) specific for detection of an abscess requiring surgical drainage. There was no difference in accuracy between US and CT (88%, 85.6-95.9 vs 85%, 76.9-93.7).

Conclusion: US and CT are both accurate in diagnosing skin and soft tissue abscesses that require surgical drainage, but US is more sensitive and CT is more specific.

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Background: Sonographic visualization of the guide wire during ultrasound-guided central venous access has been recommended to avoid inadvertent arterial cannulation. Expert sonographers can readily determine the location of the wire, but the ability of less experienced sonographers to perform this task is unknown.

Objectives: The objective of this study was to determine how well novices can identify properly and improperly placed guide wires in a vascular access model after only minimal training.

Methods: This was a prospective, observational study involving trainees with no prior experience in sonographic guide wire visualization. An opaque, simulated vascular access model was created using a previously described technique. Guide wires were positioned either inside or adjacent to simulated internal jugular (IJ) veins. During a 5-minute demonstration subjects were taught to scan each guide wire to determine its location (inside or outside the target vein). Afterwards, subjects scanned a test onwards, subjects scanned a test wire containing five wires with unknown positions relative to the corresponding IJ veins. Participants recorded their answers as inside, outside, or unsure. The test characteristics of sonographic guide wire localization were determined using known wire location as the criterion standard.

Results: Twenty-one residents and nineteen medical students participated. Among 200 wire visualization attempts there were 156 true positives (intravascular wire correctly identified), 38 true negatives (extravascular wire correctly identified), 2 false negatives (wire mistakenly labeled as outside), and 2 false positives (wire mistakenly labeled as inside). Additionally, 2 cases in which the participant marked “not sure” were considered errors, both of them false negatives. Test characteristics were sensitivity 97.5% (CI95 93.3% - 99.2%) and specificity 95.0% (CI95 81.8% - 99.1%). The overall accuracy rate was 97.0%. No errors were committed by upper level residents.

Conclusion: Sonographic guide wire visualization, an important step for ensuring proper vessel cannulation during central venous access, can be accomplished by novices with a high degree of accuracy on an inanimate model. Trainees learning ultrasound-guided central line placement should be taught this simple technique as a routine patient safety measure.

277 The Impact of Scenario-based Training and Real-time Technology Feedback on CPR Quality and Survival From Out-of-hospital Cardiac Arrest
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1University of Arizona, Tucson, AZ; 2Mesa Fire Department, Mesa, AZ; 3Guardian Medical Transport, Flagstaff, AZ; 4ZOLL Medical Corporation, Boston, MA; 5Maricopa Integrated Healthcare System, Phoenix, AZ

Background: The quality of chest compressions (CCs) has been shown to affect outcomes in out-of-hospital cardiac arrest (OHCA). However, CC quality is highly variable, even among certified emergency medical services (EMS) professionals. While new defibrillator technologies with real-time audiovisual feedback (RTAVF) have been shown to improve CC quality, no studies have reported an effect on survival.
Objectives: We performed a prospective, before/after trial of specific scenario-based training (SBT) combined with novel RTAVF technologies among three EMS agencies (two suburban/one rural).

Methods: Data were obtained from EMS first care forms and RTAVF-capable defibrillators (E Series, ZOLL Medical). Outcomes were obtained from receiving hospitals. Phase 1 (P1-before) consisted of 1 year of baseline data collection with the RTAVF mode disabled (5/09–4/10). Then three interventions occurred: 1) SBT of ~450 EMTs/paramedics (3 hours focused on CC rate/depth, chest wall recoil, minimizing CC interruptions and over-ventilation), 2) RTAVF enabled and actively utilized during arrests, 3) individual and supervised case debriefing using code review software. Phase 2 (P2) consisted of 4 months of data collection following implementation of the interventions. To decrease the potential for a Hawthorne effect, the providers were aware that CPR quality was being evaluated via event recording during both phases.

Results: 219 adult (age ≥18) cases occurred in P1 and 68 in P2. Three cases (1.4%) were excluded from P1 (missing survival data). The groups were well-matched for demographic/clinical characteristics. The means for all quality measures moved from outside of guideline-based targets during P1 to inside during P2: CC rate (mean 123/min to 106 (p < 0.0001); CC depth (mean 1.8 in. to 2.2 (p < 0.0001); pre-shock CC pause duration (mean 25 sec to 9 (p = 0.002); post-shock pause duration (mean 20 sec to 5 (p = 0.0004). CC fraction (mean 64% to 83% (p < 0.0001). Survival to discharge increased from 10.2% (22/216) to 16.2% (11/68; p = 0.195) for all rhythms and from 31.3% (21/67) to 58.8% (10/17; p = 0.036) for ventricular fibrillation (VF). Conclusion: SBT combined with event debriefing and RTAVF was associated with significant improvement in CC quality and an 88% relative increase in survival among VF patients. We believe this is the first report to show an improvement in survival with the use of new defibrillator technology that provides RTAVF.

278 Intraosseous Versus Intravenous Vascular Access During Out-of-hospital Cardiac Arrest
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1Methodist Hospital System, Dallas, TX;
2Carolina's Medical Center, Charlotte, NC;
3Mecklenburg EMS Agency, Charlotte, NC

Background: Intraosseous (IO) needle insertions during out-of-hospital cardiac arrest (OOHCA) are rapidly replacing peripheral intravenous (IV) routes in the prehospital setting. However, there are little data directly comparing the effectiveness of IO to IV during OOHCA.

Objectives: The objective of this study was to determine if there was a difference in the frequency of first attempt success between humeral IO, tibial IO, and peripheral IV during OOHCA.

Methods: This was a randomized trial of adult patients experiencing a medical OOHCA where resuscitation efforts were initiated. Patients were randomized to one of three routes of vascular access. Prior to every shift, paramedics were distributed a randomly selected note card indicating the prescribed route for vascular access: tibial IO, humeral IO, or peripheral IV. The selected method applied to the first attempt at vascular access only. Paramedics received intensive training and exposure to all three methods prior to study initiation. The primary outcome was first attempt success defined as secure needle position in the marrow cavity or a peripheral vein with normal fluid flow. Needle dislodgement during resuscitation was counted as a failure to maintain vascular access. In order to detect a statistical difference in the frequency of first attempt success, a minimum of 50 patients for each arm of the study were needed.

Results: There were 182 patients enrolled with 64 (35.2%) assigned to tibial IO, 51 (28.0%) humeral IO, and 67 (36.8%) peripheral IV. There was no significant difference in demographic characteristics between the study arms with a mean age of 64 years and a 65% male predominance. There were 117 (64.3%) patients who experienced initial vascular access success with 16 (13.7%) of those becoming dislodged for an overall frequency of first attempt success of 101 (55.5%). Individuals randomized to tibial IO were more likely experience a successful first attempt at vascular access (58, 90.6%) compared to either humeral IO (17, 33.3%) or peripheral IV (26, 38.8%; p=0.001).

Conclusion: This is one of the first prehospital randomized trials to assess the effectiveness of three common methods of gaining vascular access during OOHCA. Results from this study indicate the tibial IO as the more effective method of gaining vascular access during OOHCA when compared to peripheral IV and humeral IO.

279 Frequency of Organ and Tissue Donation in Out-of-hospital Cardiac Arrest Patients
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Background: Despite recent public awareness campaigns, the rate of organ and tissue donation in the United States remains low. It is unknown what the rate of tissue and organ donation is in patients suffering out-of-hospital cardiac arrest (OOHCA).

Objectives: To descriptively report the rate of organ and tissue donation and the demographic characteristics of donors using data abstracted from a prospective, multicenter, controlled clinical trial in OOHCA patients.

Methods: Organ and tissue donor status (and type of organ or tissue, if applicable) was prospectively abstracted from the medical record of patients enrolled in a randomized, controlled, multicenter clinical trial. The frequency of donation and number of donations per donor were calculated. Donors were stratified by age group (18–34; 35–49; 50–64; >65 yrs) to determine which group accounted for the highest number of donors, as well as the highest number of organs and tissues donated.

Results: Organ and tissue donor data were abstracted from 1239 patients with an OOHCA between October 2005 and July 2009 who were brought to a hospital and died in the emergency department or following admission to the hospital. A total of 85 patients became organ or tissue donors (6.9%), resulting in 234 total organ or tissue donations (organ = 39.3%, tissue = 60.7%). Fifty-one donors (58.4%) donated more than one organ or tissue. The most frequently donated organ was the eye (43/92; 46.7%), followed by the kidney (16/92; 17.4%) and the liver (12/92; 13.0%). There were also 7 heart donations (7/92; 8%). The most frequent tissue donation was bone (42/142; 29.6%), followed by connective tissue (37/142; 26.1%) and skin (25/142; 17.6%). The mean age of donors was 56.08±13.85 years (range = 18 –81), with patients between the ages of 50–64 years accounting for 47% of all donors and 50% of the total number of organ or tissue donations.

Conclusion: In this OOHCA population, the frequency of organ and tissue donation was 6.9%. While not the primary intent of any OOHCA resuscitation effort, the secondary benefit of harvesting organs and tissues for donation provides a meaningful and important mechanism to increase donation overall.
on patient outcomes. Proponents of double paramedic configuration suggest benefit in “advanced life support (ALS)-intensive” cases such as out-of-hospital cardiac arrest (OHCA). Opponents cite cost, a reduction in individual skills performance due to “dilution” of experience, increase in on-scene interval (OSI), and neglect of basic life support (BLS) interventions that may have demonstrated benefit.

**Objectives:** We evaluated the relationship between crew configuration and several clinical and operational parameters in adult OHCA patients.

**Methods:** Retrospective analysis of a clinical database from a large, multi-system, national EMS provider that provides EMS across widely diverse communities (63 operations in 24 states; 2008–2009). All records for adult (≥18 yrs) OHCA cases were included. Relationships were evaluated between crew configuration and OSI, performance of endotracheal intubation (ETI), ALS medication use, and return of spontaneous circulation (ROSC). We used Fisher’s exact test, ANOVA, or Kruskal-Wallis test to determine statistical significance (z=0.05).

**Results:** 7,794 records met inclusion criteria; 697 (8.9%) were excluded because they were treated by nurses, physicians, or BLS-only crews. Distribution of the remaining 7,097 cases was: paramedic/EMT (1P) (89.6%); two paramedics (2P) (10.4%). Age and sex were well-matched between groups (p>0.5). OSI was not significantly different (1P= 19:17, CI 19:00–19:34; 2P= 20:19, CI 19:24–21:14). A significantly higher proportion of 2P patients received medications (73.3% vs. 65.2%, p<0.001), were intubated (61.8% vs. 54.5%, p<0.001), and were transported emergently to the hospital (64.1% vs. 58.0%, p<0.002). More 1P patients were declared dead on arrival by the paramedic and not resuscitated (2P: 19.6% vs. 1P 24.0%, p=0.007). Theprehospital ROSC rates were higher for the 2P crew (2P: 25.0% vs. 1P: 21.3%, p=0.024).

**Conclusion:** In a very large population of adult OHCA patients from widely varied types and sizes of EMS systems, there were small but statistically and potentially clinically significant associations with OSI, medication administration, ETI rates, and ROSC when dichotomized by ALS crew configuration. Further work is necessary to better understand the clinical significance of these findings.

# 281

**Save a Life Campaign: Are We Reaching Our Citizens? A City-wide Hands-only CPR Training Campaign Reaches People Across Diverse Ethnic, Socioeconomic, and Education Groups.**

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**Background:** The 2010 American Heart Association Guidelines provide strong recommendations that “all rescuers, regardless of training, should provide chest compressions to all cardiac arrest victims” and further describe the building blocks of cardiopulmonary resuscitation (CPR) that hinge on early hands-only CPR for un/minimally trained rescuers. In an effort to disseminate the message of hands-only CPR, our city partnered with the YMCA and local hospitals to train our citizens on hands-only CPR over an 8-day period.

**Objectives:** The primary objective of this study was to characterize the demographics of the citizens who participated in our mass CPR training.

**Methods:** Setting: urban/suburban, fire-based emergency medical services (EMS) agency serving 600,000 and bystander CPR rates of 35%. Community notification was by television, radio, print, and electronic media in both Spanish and English. Participants completed an IRB-approved questionnaire that captured their age, sex, address, race/ethnicity, highest level of education achieved, annual household income, and profession. Data elements were captured and descriptive statistics are presented.

**Results:** During the 8-day campaign, 709/730 (97%) participants completed the form. The median (IQR; range) age was 39 (30.5–3–95) years; 408 (57.5%) were female, 432 (61%) were white, 95 (12%) were black, 83 (12%) were Latino, and 45 (6%) were Asian. 304 (43%) had previously taken a formal CPR course; in terms of highest education achieved: 86 (12%) middle school, 106 (14%) finished high school; 170 (24%) completed college, and 68 (9.5%) completed an advanced degree*. For annual income, 69 (10%) were below the poverty threshold of $10,000, and 25% had incomes of $100K. Compared to census data, we were able to train a group whose ethnicity mirrors the community, with the exception of Latinos, who were under-represented. *Due to space limits not all categories are presented. Limitations: Self-reporting bias.

**Conclusion:** A community hands-only CPR campaign was able to reach a diverse population. These results may provide insight for communities planning similar CPR training. Future research needs to identify obstacles and best strategies for reaching our Latino population.

# 282

**Can Nebulized Naloxone Be Used Safely and Effectively by Emergency Medical Services for Suspected Opiate Intoxication?**

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**Background:** Emergency medical services (EMS) traditionally administer naloxone using a needle. Needle-less naloxone may be easier when IV access is difficult and may decrease occupational blood-borne exposure in this high-risk population. Recent studies have examined intranasal exposure, but nebulized naloxone (NN) as an alternative needle-less route has not been examined in the prehospital setting.

**Objectives:** We sought to determine if NN can be used safely and effectively by prehospital providers.

**Methods:** We performed a retrospective analysis of all consecutive cases administered NN between January 1 and June 30, 2010 by the Chicago Fire Department. All clinical data were prospectively entered in real time into a structured EMS database. Variables and outcomes were determined a priori and data abstraction was performed in a systematic manner. Included were cases of suspected opiate overdose, altered mental status, and respiratory depression; excluded were cases where NN was given for opiate-triggered asthma and cases with incomplete outcome data. The primary outcome was the response to NN. Secondary outcomes included need for rescue naloxone by any route or need for intubation. Kappa inter-rater reliability was calculated; study data were analyzed using descriptive statistics and Student’s t-test.

**Results:** Out of 128 cases, 105 met inclusion criteria. Of these, 23 (22%) had complete response, 62 (59%) had partial response, and 20 (19%) had no response. Only 10% needed rescue naloxone; no case needed intubation, and no adverse events occurred. Response to NN was not associated with age, sex, time to patient, or initial GCS score. Response was associated with NN dose (p=0.017), time to treatment (p=0.032), and initial respiratory rate (p=0.001). Kappa score was 0.993.

**Conclusion:** Nebulized naloxone is a safe and effective needle-less alternative for prehospital treatment of suspected opiate intoxication, especially when given early, in a larger dose, and in patients with spontaneous respirations.
Background: Many patients transported to the emergency department (ED) by helicopter are discharged within one day of arrival, but scant evidence exists regarding which patients characteristics are associated with early discharge after helicopter transport.

Objectives: We sought to identify predictors of discharge within 24 hours among patients transported to the ED by helicopter.

Methods: We retrieved statewide data on all trauma patients transported by helicopter from 1/1/07–12/31/09. Data included patient age, sex, race, injury severity score (ISS), initial systolic blood pressure (SBP), respiratory rate (RR), Glasgow Coma Scale (GCS) score, mechanism of injury (MOI), and time to discharge. The primary outcome was time to discharge (<24 vs >24 hrs).

Results: Of the 5,126 patients included in the study, 780 (15.2%, 95% CI 14.3–16.2%) were discharged within 24 hours. Statistically significant predictors of early discharge were the same on basic and regression analyses, and included ISS, SBP, RR, age, and MOI. Every 1-point ISS increase was associated with decreased likelihood of early discharge (OR 0.94 [0.92–0.96]). At a SBP of 100 increased the likelihood of early discharge (OR 1.59 [1.34–1.87]). RR <18 or >24 was associated with decreased likelihood of early discharge (OR 0.40 [0.26–0.60] and 0.62 [0.46–0.83]). Age <18 was predictive of early discharge (OR 1.64 [1.32–2.04]), while age >65 was associated with decreased likelihood of early discharge (OR 0.40 [0.26–0.60] and 0.62 [0.46–0.83]). Patients with burns (OR 0.08 [0.04–0.19]) or penetrating trauma (OR 0.50 [0.36–0.70]) were less likely to be discharged within one day, while other assault was associated with an increased likelihood of early discharge (OR 1.77 [1.04–3.03]). Sex, race, and GCS =15 were not significantly associated with early discharge.

Conclusions: Fifteen percent of patients transported to the ED by helicopter were discharged within one day. Predictors of early discharge in this study population include lower ISS, SBP >100, RR between 8 and 24, age <18, and assault as the MOI. These findings may provide a starting point for future studies attempting to develop evidence-based guidelines regarding appropriate candidates for air medical transport.

Background: Understanding the distribution of critical illness within a community may provide public health stakeholders with information that can be used to improve access to specialized care.

Objectives: We hypothesized that severe sepsis patients transported by emergency medical services (EMS) would exhibit clustering as opposed to a random distribution within the community.

Methods: Prospective, observational study of patients with severe sepsis transported to the emergency department (ED) by EMS and treated with early goal-directed therapy (EGDT). Inclusion criteria: suspected infection, two or more criteria for systemic inflammation, and either systolic blood pressure <90 mmHg after a fluid bolus or lactate >4 mM. Exclusion criteria: age <18 or need for immediate surgery. Patient location at the time of EMS dispatch was geo-coded into the EMS agency’s computer-aided dispatch system, which then interpolated the longitude and latitude of the call. This information was used to calculate Ripley’s K function and produce a kernel density function. Other data collected included self-reported patient location as private residence or chronic care facility.

Results: There were 167 patients transported by EMS eligible for analysis with 57% from a private residence and 23% from a chronic care facility. According to Ripley’s K function, sepsis patients cluster significantly more than expected under the assumption of complete spatial randomness. Also, the kernel density function indicates that there is one cluster with significantly more sepsis patients concentrated within small areas than one would expect in a randomly distributed population.

Conclusion: Results from this study identified clusters of severe sepsis patients presenting to the ED by EMS providers. Community education, public health initiatives, and EMS interventions could be targeted at clusters of cases, thereby changing response patterns and demands on EMS resources.

Background: In clinical trials of therapies delivered by paramedics in the prehospital setting, the timing of drug administration is often important, but a common reliable reference from which to measure this time is elusive. Ambulance time of arrival (TOA) on scene is frequently used, but consistent and accurate measurement is difficult within and across emergency medical services (EMS) systems.

Objectives: To determine the accuracy of accelerometer-derived TOA measurements using a small self-contained instrumented emergency medical data logger (DL) in simulated EMS runs.

Methods: Controlled field test of research methodology. In simulated EMS runs, on varying road surfaces, true latencies between vehicular TOA (T1), ambulatory TOA (T2, at “patient’s” location), and time of “treatment” were varied and recorded. T1 was estimated from power spectrum analysis of DL accelerometry using fully automated (T1A) or visually assisted methods (T1V) to distinguish patterns consistent with driving and walking. T2 was estimated only with the visual method (T2V). Variation from true TOA (AT) was determined for the automated and for each of three independent blinded readers using the visual approach. Inter-reader reliability was assessed by correlation coefficient (Pearson’s r). A sample size of 40 (assuming mean 2, SD 1.5) was sufficient to determine a confidence interval of ± 0.5 minutes.

Results: Accelerometry data from 39 of 40 simulated EMS runs were analyzed (1 missing due to DL malfunction). Variation from true vehicular TOA (in minutes, mean ± SD) by visualization (AT1V) was less than with automated interpretation (AT1A) or ambulatory TOA (AT2V) (see the Table, next page). Inter-reader reliability of visual determinations was very strong (Pearson r = 1.0 for TIV, 0.996 for T2V). TIV was distributed on either side of T1, while T1A was consistently later than T1.

Conclusion: The measurement error of TOA estimates based on accelerometry data from a small portable instrumented emergency medical DL has been characterized. Objective, consistent, autonomous TOA measurements are feasible in EMS clinical trials.
286  Human Effects of Prolonged Exposure to a New 40 mm Conducted Electrical Weapon

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Background: Modern conducted electrical weapons (CEWs) are handheld devices used in the field to control violent persons, and emergency medical services (EMS) personnel may evaluate these persons after exposure. CEW maximum range is 35 feet due to wire-tethered connections. In some situations, a range greater than this may be helpful. A 40 mm CEW (40 CEW) under development is untethered, fired from a 40 mm launch platform (currently used by military/ law enforcement), has longer range, and a new circuit and power source.

Objectives: We report the physiologic effects of this circuit on humans.

Methods: Volunteers received body mass index (BMI), pre/post-exposure ECGs, and vital sign/oxygen saturation measurements (VS). They received a venous catheter for blood sampling analysis and were analyzed using descriptive statistics and Wilcoxon sign rank test.

Results: Twenty-one subjects enrolled, and one withdrew (declined exposure). Median age was 33 years (range 20-52), 77% male. Median BMI was 23 kg/m² (range 18-31). No significant adverse events were reported. There was no difference in VS before or after exposure. All ECGs demonstrated sinus rhythm. All troponins were negative. Two subjects had CK >1000 units/L at 24 hours post exposure. Continuous breath-by-breath analysis was performed before, during, and after exposure. Exposure was with 1 CEW probe placed in the left side of the abdomen and a second contact point taped to the left thigh with a 12-inch spread. Exposure was for 15 seconds, powered by the 40 CEW circuitry. Data were analyzed using descriptive statistics and Wilcoxon sign rank tests.

Conclusion: Prolonged exposure to the 40 CEW appears to have similar physiologic effects on humans when compared to previous published CEW studies. The 40 CEW has the added benefit of longer distance deployment from available 40 mm launch platforms.

<table>
<thead>
<tr>
<th>Method</th>
<th>ΔT1E (vehicle arrival)</th>
<th>ΔT2E  (at patient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visualization</td>
<td>Reader 1 1.08 (1.26)</td>
<td>2.49 (3.58)</td>
</tr>
<tr>
<td></td>
<td>Reader 2 1.03 (1.27)</td>
<td>3.96 (4.73)</td>
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<tr>
<td></td>
<td>Reader 3 1.56 (1.37)</td>
<td>0.82 (1.37)</td>
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<tr>
<td></td>
<td>Total 1.22 (1.31)</td>
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<td>Automated</td>
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</table>

287  Association of Emergency Medical Dispatch Codes With Emergency Department Outcomes

A. Zachary Hettinger1, Jeremy T. Cushman2, Manish N. Shah3, and Katia Noyes4
1Washington Hospital Center/MedStar, Washington, DC; 2University of Rochester School of Medicine & Dentistry, Rochester, NY

Background: Emergency medical dispatch systems are used to help categorize and distribute emergency medical services (EMS) resources for requests for assistance through 9-1-1 phone calls.

Objectives: We hypothesized that a subset of dispatch codes could predict patient outcomes (emergency department [ED] discharge versus hospital admission/ED death) with a predictive value of 90% or greater.

Methods: This retrospective study analyzed requests for EMS through an Emergency Communications Department (ECD) serving a mixed urban/suburban community in 2009. Subjects were included if (i) the call was coded using the Medical Priority Dispatch System (MPDS); (ii) a local EMS agency responded, and (iii) patients were transported to a study hospital. Probabilistic matching was used to link subjects from the ECD, EMS, and ED databases. Descriptive statistics and 95% confidence intervals (CI) were obtained for dispatch codes, or code groupings (9E vs. 9E1, 9E2, etc.), that were used more than 50 times in a year. These 107 codes accounted for 92% of all MPDS coded calls.

Results: After matching 90% of ECD records to EMS data and 84% of EMS records to ED admissions, the study population included 27,017 subjects. The average age of the cohort was 46.2 years (SD 24.8); 54% were female. Of the total cohort of transported patients, 70% were discharged from the ED. Nine out of 107 codes had a 90% or greater predictive power for ED discharge, including 4A1 (2)/4B1 (assault/sexual assault), 31A (unconscious/fainting), 29B1 (traffic accident), 10A1 (chest pain), 2602 (sick person), and 2A2 (D1/2 allergic reaction). Three code groupings had more than 60% predictive power for ED admission/death, including 28C1/28C3 (stroke) and 9E (cardiac/ respiratory arrest).

Conclusion: In the evaluated system, a small subset (8% of codes; 7% by call volume) of emergency medical dispatch codes was associated with greater than 90% predictive ability for ED discharge. These findings could provide evidence on how and which EMS resources should respond to specific codes, as well as to provide advanced notification to area hospitals for bed/resource management. Future studies are needed to validate these findings for other geographic areas and to investigate possible strategies for improvements of dispatch and overall EMS systems.

<table>
<thead>
<tr>
<th>pH and Lactate (mg/dL) Data</th>
<th>Pre-Exposure</th>
<th>Post-Exposure</th>
<th>2 Minutes Post-Exposure</th>
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<th>6 Minutes Post-Exposure</th>
<th>8 Minutes Post-Exposure</th>
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<tr>
<td>pH (median)</td>
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<td>0.9-6.0</td>
<td>0.9-4.3</td>
<td>1.4-5.2</td>
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</tbody>
</table>

288  Factors Associated With Ambulance Use Among Emergency Department Patients

Gary Vilke, Ericha Anthony, and Edward Castillo
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Background: Ambulance services are a vital community resource but are often utilized for non-urgent or emergent conditions.

Objectives: To identify and describe factors associated with ambulance use among emergency department (ED) patients and to
identify the interest in potential alternatives to ambulance transports.

Methods: This was a prospective cross-sectional study of patients recruited from two EDs with a total annual census of 60,000 patients. One hospital is an urban, academic teaching hospital (Level I trauma center) with an annual census of approximately 37,000 visits. The other hospital is a suburban community hospital with an annual census of approximately 23,000 visits. A survey tool was used to obtain participant demographics and socioeconomic information, past and current use of the ED and of ambulance services, and their willingness to consider alternatives for transportation for medical care. Means and frequencies were used to describe participants. Univariate and multivariate analyses were used to assess factors associated with ambulance use.

Results: A total of 506 patients between 18 and 93 years of age were enrolled over the study period. Ninety-seven patients (19.2%) arrived at the ED via ambulance while 409 (80.8%) used a different mode of transportation. Differences in ambulance use were identified by age, sex, income, education, marriage status, living situation, normal mode of transportation, past ED visits, prior emergency medical services (EMS) transports, and acuity level (p<0.05). Logistic regression identified that those who did not drive their own car for their normal mode of transportation (OR 2.3, 95% CI=1.1–5.1, p=0.031), prior ambulance transport (OR 29.3, 95% CI=2.4–158.2, p=0.006) and prior hospital transport (OR 2.3, 95% CI=1.1–5.1, p=0.031), prior ambulance transport (OR 9.8, 95% CI=0.8–114.1, p=0.068; moderate/urgent OR 19.4, 95% CI=2.4–158.2, p=0.006) were independently associated with increased odds to utilize ambulance services.

Conclusion: Socioeconomic factors such as income and education levels were associated with increased EMS utilization. Daily mode of transportation and previous EMS utilization were also shown to be associated with EMS use. These data suggest that there is a lack of patient self-triage in determining the proper means of transportation to the ED for their medical condition. There is a need for improved community education for patients regarding EMS utilization.

Background: Rational utilization of emergency medical services (EMS) resources at mass gathering events is imperative in providing efficient medical care for participants, spectators, and the host city’s general population. At marathons, runners succumb to injury and illness at all points along the route, while the general population of the host city continues to require EMS at baseline rates. Therefore, knowledge of the location of ambulance requests originating along a marathon route can aid in the coordination of EMS assets.

Objectives: To describe the location of medical calls requiring ambulance transport along a marathon route and the mile marker location was noted. Descriptive statistics were then utilized.

Results: 158 and 137 ambulance transports were completed in 2008 and 2010, respectively, for a total of 295 transports. 65.4% of transports originated along the route, 17.6% from non-medical facilities in the finish area, and 16.9% from medical tents at the finish line. Among transports originating along the marathon route itself, 88.1% were from mile 14 to the finish, with 18.1% of calls along the route coming in the final 1.2 miles.

Conclusion: In the setting of a marathon, most ambulance transports occur in the latter half of the race route and at the end of the race. Redistributing and mobilizing resources to follow the predicted surge in ambulance transports at the end of the event may aid a unified command of event and city EMS representatives to coordinate EMS resources and reduce the impact of a large event on the prehospital medical needs of the host city. Though traditional resource allocations recommend one ambulance per 1000 mass gathering participants, at an event like a marathon, knowledge of the locations of calls along the route may help improve the allocation of limited ambulance resources and reduce the tax on the host city’s EMS resources.
Background: Pain is a major reason patients activate emergency medical services (EMS), but for reasons that are poorly understood, paramedics rarely use the analgesic agents at their disposal.

Objectives: The objective of this study was to explore paramedic beliefs and perceptions that might act as barriers to their use of prehospital analgesia.

Methods: Qualitative semi-structured interviews of paramedic opinion leaders were employed. Key informants were selected by purposive sampling of experienced paramedics from rural and urban systems that incorporate both private and hospital-based EMS agencies. Interviews were conducted by one author, recorded digitally, transcribed verbatim, and analyzed inductively. The transcripts were topic-analyzed and coded for emerging domains and recurrent themes. For this relatively homogeneous population, a large number of informants was not necessary to reach theme saturation.

Results: Eight individual and two group interviews (composed of 5 and 2 subjects) were conducted. Of the 15 key informant paramedics, four were women. Paramedics expressed greater willingness to treat pain when associated with physical evidence of limb deformity, elevated blood pressure or pulse rate, anxiety, sweating, or vomiting. In the relative absence of objective physical signs they described reticence to treat, and expressed great concern with identifying “drug-seekers.” There was a reluctance to entirely eliminate pain, and a preference to reduce it only modestly; the phrase “take the edge off” was volunteered by 40% of the medics. A preference for administering lower doses of narcotics was described by 33%, while 60% used pejorative phrases (such as “just slam them” and “just load them up”) to characterize what they viewed as overly aggressive pain management. The normalization of vital signs and the full resolution of anxiety were expressed as key endpoints to pain management. Over 73% of the paramedics felt that the use of prehospital narcotics could hamper the emergency department evaluation of painful injury or illness, most notably abdominal pain and multi-system trauma.

Conclusion: A number of potentially modifiable barriers to appropriate pain management were revealed in interviews with paramedics. Future work may assess the ability of tailored interventions to address these barriers, and thereby enhance the willingness to use appropriate analgesia.

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**Prehospital Provider Self-efficacy Decline After Pediatric Pain Management Education**

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1University of Utah, Salt Lake City, UT; 2University of Pittsburgh Institute on Aging.

Background: Pain is common among pediatric patients treated by prehospital providers (PHPs). Pediatric pain management education (PPME) positively affects PHP self-efficacy (SE). SE is a person’s judgment of his or her capability to perform certain actions and is highly congruent with clinical performance. The decline of PHP SE after PPME is unknown.

Objectives: To evaluate the decline of PHP SE after PPME.

Methods: This was a prospective study evaluating PHP SE before and after 1-hour of PPME (immediate) and 6–10 months later (longitudinal). The SE tool developed by local pediatric emergency medical services (EMS) experts used a ranked ordinal scale ranging from ‘certain I cannot do it’ (0) to ‘completely certain I can do it’ (100) for each of 10 items considered important in PPME. All 10 items were evaluated for three different age groups (adult, child, toddler), as was a composite score (0–1000).

Results: Of the 250 PHPs who completed immediate surveys, 54 PHPs have completed longitudinal surveys to date. The immediate increase in SE composite scores for all age groups persisted only for the toddler group at 6–10 months. Similarly, immediate increase in pain score use SE remained for the toddler group at 6–10 months. Mean differences are shown in the Table.

Conclusion: Increases in PHP SE occur for all age groups immediately after PPME. The increase in PHP SE persisted at 6–10 months for the toddler group alone.

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**Motor Component of the Glasgow Coma Scale (mGCS) as a Prehospital Risk Adjustment Measure for Trauma Patients**

Austin M Gross, Justin P Mitchelson, Ryan Earp, Uwe Stolz, and Dan Beskind

University of Arizona, Tucson, AZ

Background: Risk adjustment measures (RAMs) are variables that reflect a patient’s clinical characteristics and the severity of his or her physiological derangement. RAMs are used in the prehospital setting to categorize patients by disease severity and their potential disease outcome. The 6-point motor component sub-scale of the Glasgow Coma Scale (mGCS) represents a potentially powerful and easily reproducible RAM for use in the prehospital setting. The mGCS has potential advantages because it is easier to obtain than the total GCS and may have better inter-rater reliability. It has also been shown that identical total GCS scores with different combinations of GCS components have very different mortality outcomes. Because of these limitations, simplified neurologic scales have been recommended for use in the prehospital setting.

Objectives: To compare the prehospital 6-point motor component subscale of the GCS (mGCS) to the 15-point total prehospital GCS score for its ability to predict mortality or the need for prehospital intubation.

Methods: This was a retrospective analysis of trauma patients presenting to the emergency department (ED) via emergency medical services using a trauma database at a Level I trauma center between July 1, 2008 and June 30, 2010 with an injury severity score > 16 and documented prehospital and ED GCS. Logistic regression and receiver operator characteristic (ROC) analysis was used to compare the predictive power and discrimination of...
the prehospital mGCS to total prehospital and ED GCS (alpha = 0.05) for mortality and prehospital intubation.

Results: Of 1,134 total patients with an ISS>16, 792 had complete GCS data (70%). The area under the ROC curve for prehospital mGCS was 0.893 (95% CI: 0.866–0.919) for survival and 0.911 (0.888–0.933) for prehospital intubation. The prehospital mGCS area under the ROC curve was not significantly different from total prehospital (0.889; 0.861–0.916) and ED (0.911; 0.887–0.935) GCS for survival and not significantly different from prehospital total GCS (0.915; 0.892–0.937) for prehospital intubation (p>0.05).

Conclusion: The 6-point motor component of the GCS appears to be as good as a RAM as the total prehospital GCS at predicting mortality and the need for prehospital intubation in our trauma population. Further work is needed to assess this relationship in other trauma populations.

295 The Quality of Prehospital Electrocardiogram Images Obtained and Transmitted by Cellular Phone for Identifying Patients With ST-segment Elevation Myocardial Infarction

Michael C Flanders, Douglas F Kupas, and John Serra

Background: Estimates of the annual costs of hospitalizations due to acute decompensated heart failure (ADHF) and exacerbation of chronic obstructive pulmonary disease (COPD) are in combined excess of $38 billion. In the emergency department, the association between continuous positive airway pressure (CPAP) assisted ventilation, rapid vital sign improvement, and reduced endotracheal intubation (ETI) rates in both COPD exacerbation and ADHF have been described.

Objectives: Our purpose was to measure the efficacy of adding prehospital CPAP to the current severe respiratory distress protocol on initial vital signs and subsequent hospital intubation rates.

Methods: Data were obtained retrospectively from prehospital electronic medical records and emergency department charts. Consecutive adult patients with severe respiratory distress were analyzed between September 2005 and 2009. The primary endpoint was improvement in vital signs. Endotracheal intubation was a secondary end point. Comparisons were performed using a chi-square test for categorical data and a Mann-Whitney U test for nonparametric continuous variables (significance p<0.05 overall, and trend for only CHF/COPD patients).

Results: There were 375 consecutive patients with criteria for severe respiratory distress, 235 historical controls matched with 140 post intervention patients. Average age was 67 years with 55% males. There were significant median differences in improvement of vital signs favoring the pre intervention cohort; heart rate, respiratory rate, and oxygen saturation (p’s < 0.05). For CHF/COPD patients, only differences in median respiratory rates remained significant (p < 0.001). There was a significant difference in rate of emergency department intubation between the pre and post intervention groups. Pre intervention rate was 18% versus 28% for the post intervention group (p <0.05); a finding no longer significant for CHF/COPD patients (p = 0.230).

Conclusion: Standard care of high flow oxygen, nitrates, and nebulized bronchodilators appeared to be more effective in improvement of vital signs and rate of early intubation. The addition of CPAP to prehospital “severe” respiratory distress protocols had no significant effect. Aggressive early care by prehospital personnel and rapid improvement in both groups may account for lack of significant differences.

296 Safety and Efficacy of Nitroglycerin Paste in the Prehospital Management of Acute Cardiogenic Pulmonary Edema

David Lobel, Antonios Likourezos, Leonid Menkes, Emily Porter, Michael Chait, Avraham Lederman, and Grace Yau

Maimonides Medical Center, Brooklyn, NY

Background: Prehospital management of acute cardiogenic pulmonary edema centers around oxygen delivery and vasoactive medications. Non-invasive positive pressure ventilation has become more readily available in the prehospital setting, and nitroglycerin paste allows the simultaneous administration of nitrates with oxygen. Non invasive positive pressure ventilation with nitroglycerin paste has been shown to be as effective as to inhaled nitric oxide. Unfortunately there exist multiple systems to transmit these ECGs to ED physicians; there is not one uniform standard, and it can be quite costly. This creates barriers to transmitting ECGs, especially in communities lacking funding.

Objectives: Cell phones have been proposed as a method of transmitting prehospital ECGs to emergency departments (EDs) prior to patient arrival, and this technology is inexpensive and widely available. We sought to determine if the quality of images obtained and transmitted by cellular phone camera were sufficient to accurately identify STEMI.

Methods: This retrospective study reviewed prehospital cell phone ECG images transmitted to a dedicated ED e-mail address from 9/1/2008 - 7/31/2010. All transmitted ECGs were presented electronically to three board-certified emergency physicians who were blinded to patient outcome. The physicians determined whether the ECG was of adequate quality to identify STEMI. When the ECGs were actually used to activate a catheterization team, door-to-intervention times were reported.

Results: Of the 46 transmitted ECGs, the three study physicians deemed 76%, 80%, and 88% (mean 83%) to be of adequate quality to determine whether or not STEMI is present. Of the 26 transmitted ECGs with actual STEMI, when the catheterization team was contacted prior to patient arrival in the ED, the mean door-to-intervention time was 24 minutes (range 11–43).

Conclusion: ECG images obtained by cellular phone camera and transmitted to an ED are usually of adequate quality to determine whether or not STEMI is present.
interval represents approximately 5 minutes by protocol with some variability in actual time based on clinical conditions.

**Conclusion:** Nitroglycerin paste can safely be administered by paramedics for the treatment of acute pulmonary edema.

### 297 Probabilistic Linkage of Emergency Medical Services Records and Statewide Emergency and Patient Discharge Data

Prasanthi Govindarajan1, Betty Mobed1, David Ghillardiç, and Claiborne Johnston1

**Background:** Privacy laws limit availability of outcomes to emergency medical services (EMS), thereby limiting their ability to assess their performance.

**Objectives:** While published studies have reported methods to link multiple databases, we describe the feasibility of a novel probabilistic matching method to link prehospital data with emergency department (EDD) and patient discharge data (PDD).

**Methods:** Ambulance data for two California counties were matched with statewide EDD and PDD records from 2005–2007. Subjects were excluded if they were non-EMS transports admitted to the hospital directly or if they were released on scene by EMS. Matching was accomplished using the following subject variables: date of birth (DOB), sex, race, subject’s ZIP code and county of residence, hospital ID number, hospital county and ZIP code, and date of admission (DOA). Matching was done step-wise between the EMS and PDD, followed by EMS and EDD, using combinations of complex-variables (concatenation) created in STATA (StataCorp, TX).

**Results:** We linked 3026 EMS records with 28,261 PDD records and 6524 EDD records, respectively. Using a combination of sex, DOB, and DOA, 1305 unique matches were made between EMS and PDD (1305/3081=43%). An additional 13 EMS-PDD matches occurred when matched by sex, race, and hospital ZIP code. 422 EMS records and 159/6524 EDD records did not have patient ZIP codes and were omitted in the next matching process. Using a combination of sex, race, patient, and hospital ZIP codes we matched 12% (744/6365) of EMS-EDD records. After adding back the omitted records and using a combination of sex, race, and DOA we matched an additional 8% (321/3665) of the EMS-EDD records. In the last step, we matched 12% (744/6365) of EMS-EDD records. After adding back the omitted records and using a combination of sex, race, and hospital ZIP code we matched 12% (744/6365) of EMS-EDD records. The median CD4 cell count for the nine patients newly diagnosed with HIV was 201/microliter (range 71–429/microliter).

**Conclusion:** Certification level, experience, service type, and call volume were found to be associated with increased prevalence of depression. The long term effects of occupational exposure to traumatic events are largely unknown in EMS. Future research should focus on exploring this relationship.

### 298 Depression Among Nationally Certified Emergency Medical Service Professionals: A Descriptive Study

Melissa A. Bentley1, J. Mac Crawford2, J. R. Wilkins III3, Greg Gibson3, and Antonio R. Fernandez1

1National Registry of EMTs, Columbus, OH; 2The Ohio State University, College of Public Health, Columbus, OH

**Background:** Scant evidence exists concerning the effects of traumatic exposure, such as death of a child, on the EMS professional.

**Objectives:** The study objectives were to identify characteristics associated with, and the prevalence of, depression among EMS professionals.

**Methods:** Data were obtained from the National Registry of EMTs 2009 recertification survey. This survey included demographic (sex, education level, exercise, and smoking status), personal, and work-life characteristics items (certification level, community size, service type, call volume, experience, and health status). Depression status was determined by a score of ≥10 on the DASS-21. Inclusion criteria required individuals to be currently practicing EMT-Basics or Paramedics. Descriptive statistics and chi-square analyses were used (α=0.05).

**Results:** 53.6% responded to the survey (34,340/64,032). The prevalence of depression was 6.8% (n=1,589). Paramedics were more depressed than EMT-Basics (9.3% vs. 4.4%). A step-wise increase was seen with experience; those with ≤2 years of experience (4.0%), 3–7 years (5.0%), 8–15 years (7.6%), and ≥16 years (9.2%) were depressed. The prevalence of depression was higher for hospital-based (9.2%) services when compared to county (8.9%), private (9.0%), fire-based (5.4%), and those service types categorized as other (4.2%). Those reporting moderate call volume (10–39 calls, 8.1%) were more likely to be depressed than low (5.5%) and high (7.9%) call volumes. A step-wise increase in depression proportion was seen with decreasing health; with 2.7% of those with excellent, 5.8% with very good, 11.0% with good, and 29.8% with fair/poor health, reporting depression. When compared to never smokers (6.0%) and former/ever smokers (7.4%), current smokers (9.1%) were more likely to be depressed. All above variables were statistically significant (p-value<0.05).

**Conclusion:** Certification level, experience, service type, and call volume were found to be associated with increased prevalence of depression. The long term effects of occupational exposure to traumatic events are largely unknown in EMS. Future research should focus on exploring this relationship.


Matthew E Prekker1, Brandi Gary1, Travis Olives1, Roma Patel1, Sarah Gordon2, Ronald Schult1, and Richard O Gray1

1Hennepin County Medical Center, Minneapolis, MN; 2Minnesota Department of Health, St. Paul, MN

**Background:** The optimal testing strategy to identify emergency department (ED) patients unaware of their HIV infection remains unclear.

**Objectives:** To compare the yield of two different strategies for utilizing rapid HIV tests in the ED: 1) routine, opt-out HIV screening as recommended by the Centers for Disease Control and Prevention, and 2) physician-directed targeted testing with intent to either diagnose or screen, as assessed by a prospective query of treating ED physicians.

**Methods:** All eligible adult patients underwent routine, opt-out, rapid HIV screening during randomized blocks of time totaling 342 hours between October 26, 2009 and October 19, 2010 at an urban county hospital ED with 98,000 annual visits. The treating physicians were asked if they would have ordered a rapid HIV test for diagnostic or screening purposes immediately after their index encounter with a study patient. Surveyed physicians were blinded to the results of the rapid HIV test.

**Results:** During the study period, 2811 of 3938 eligible patients (71%) were screened with a rapid HIV test which resulted in 9 new diagnoses of HIV infection (0.32% of those tested; 95% CI 0.16%–0.63%). Physicians indicated their intent to test or screen in 2290 of these 2811 encounters (82%). Physicians would pursue diagnostic testing in far fewer instances (172 of 2299 encounters, 7.5%) than they would use a rapid HIV test for screening purposes (758 of 2299 encounters, 33%). None of the new HIV cases identified by routine, opt-out HIV screening would have been picked up by physician-directed diagnostic testing. Moreover, physicians indicated their intent to screen only 2 of 9 patients for HIV infection who were ultimately discovered to be HIV positive. The median CD4 cell count for the nine patients newly diagnosed with HIV was 201/microliter (range 71–429/microliter).
**Conclusion:** The majority of new HIV diagnoses made with a non-targeted, opt-out rapid HIV screening program would have gone unidentified with a strategy of physician-directed targeted screening or diagnostic testing.

**300 Reduction in Emergency Department Blood Culture Contamination With Implementation of Sterile Blood Culture Collection Kits**

Wesley H Self, Theodore Speroff, Alan B. Storrow, Jacki Ashburn, Robert S. Dittus, and Thomas R. Talbot

Vanderbilt University Medical Center, Nashville, TN

**Background:** Blood culture contamination is a common and costly problem that can be minimized through meticulous sterile technique during blood collection.

**Objectives:** To determine if implementing pre-packaged, sterile blood culture collection kits and an accompanying checklist leads to reduction in blood culture contamination in the emergency department (ED).

**Methods:** We conducted an interrupted time series study in an ED at an academic, tertiary care medical center. During the baseline period (3/1/09 - 1/30/10), cultures were collected via clean technique, which included skin antisepsis with a 0.67 ml solution of 2% chlorhexidine gluconate and 70% isopropyl alcohol (Chloraprep, CareFusion), no sterile gloves, and no standardized equipment. During the intervention period (1/31/10 - 10/23/10), cultures were collected via sterile technique with the Sterile Blood Culture Collection Kit, which contained a sterile drape, 21g needle, 3 ml Chloraprep, and checklist outlining optimal use of the kit. Prior to implementing the kits, we trained the ED nurses how to use the kits with a workshop and training video. We classified cultures as contaminated if any of the following grew: *Aerococcus, z-hemolytic Streptococcus, Bacillus except anthracis, Coagulase-negative Staphylococcus except lugdunensis, Corynebacterium, diphtheroids, Micrococcus, Propionibacterium.* In a time series analysis with biweekly intervals, we compared the proportion of cultures contaminated during the baseline and intervention periods. We used a multivariate linear regression model with the baseline trend, intervention trend, and period (baseline vs intervention) as independent variables.

**Results:** During the intervention period, 133/4,964 (2.68%) cultures were contaminated, compared to 496/1,860 (6.65%) cultures contaminated during the baseline period. There was a non-statistically significant secular trend toward lower contamination during the baseline ($b$-coefficient: -0.00047, 95% CI: -0.0012 to .00026). In a time series regression adjusting for secular trends, the absolute reduction in contamination associated with implementation of the intervention was 2.85% (95% CI: 1.35% to 4.38%) (see Figure). We found no evidence of autocorrelation.

**Conclusion:** Implementing standardized, sterile blood culture collection kits is feasible and effective at reducing contamination in an ED with a high baseline contamination rate.

**301 The Burden of Emergency Department Visits Due To 2009 Pandemic H1N1 Influenza in Davidson County, Tennessee**

Wesley H Self, Helen K Talbot, Carlos G Grijalva, Yuwei Zhu, Astride Jules, Kyle E Widmer, John Williams, and Marie R. Griffin

Vanderbilt University Medical Center, Nashville, TN

**Introduction:** Measuring influenza burden is essential to optimize emergency department (ED) operations and to evaluate influenza prevention and control policies.

**Objective:** We estimated the incidence of ED visits due to 2009 pandemic H1N1 influenza in Davidson County, TN.

**Methods:** We conducted active, prospective, population-based surveillance in the children’s and adult EDs at Vanderbilt Medical Center, a tertiary care center serving 50% and 15% of county children and adults. Patients presenting with an acute respiratory illness (ARI) (ICD9 381–382, 460–466, 480–487, 490–493, 786, 780.6) were approached from May 2009-April 2010. Nasal and throat swabs were tested for H1N1 influenza targets using RT-PCR. We used two methods to estimate incidence. For the sampling method, we calculated age- and season-specific proportions of patients enrolled who tested positive for H1N1. We applied these proportions to all ARI-associated ED visits among county residents. For the capture-recapture method, we linked influenza patients identified by two independent methods: the surveillance study and routine ED care. By identifying “matched” patients, total influenza cases were calculated using the Peterson estimator and population-based rates were calculated using age-specific market share weights.

**Results:** In the surveillance study, 88 of 828 subjects tested positive for H1N1. On clinically obtained tests in the EDs, 541 patients were H1N1-positive. Linking influenza patients resulted in 2, 7, and 0 matches for ages < 5, 5–17, 18–49, and ≥ 50 years, respectively. We calculated incidence rates by the sampling and capture-recapture methods (see the Table). Capture-recapture estimates could not be calculated for the ≥ 50 age group due to no matches.

**Conclusions:** Two methods yielded similar estimates of ED visit rates associated with the 2009 H1N1 influenza pandemic. Greater than 1% of the entire population sought care in the ED due to influenza. Compared to seasonal influenza, H1N1 disproportionally affected younger people.

<table>
<thead>
<tr>
<th>Influenza-Associated ED Visit Rate/1,000 Residents</th>
</tr>
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<tbody>
<tr>
<td><strong>Age Group</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
</tr>
<tr>
<td>5–17</td>
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<tr>
<td>18–49</td>
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<tr>
<td>≥ 50</td>
</tr>
<tr>
<td>Total</td>
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</table>

**302 Google Flu Trends: Correlation With Emergency Department Influenza Rates and Crowding Metrics**

Andrea Freyer Dugas1, Scott Levin1, Darren Mareiniss1, Yu-Hsiang Hsieh1, Jesse Pines2, Amir Mohareb1, Trish Perl1, Charlotte Gaydos3, and Richard Rothman1

1. Johns Hopkins University, Baltimore, MD; 2. George Washington University, Washington, DC; 3. Johns Hopkins, Silver Spring, MD

**Background:** Google Flu Trends (GFT) is a novel internet-based influenza surveillance system that uses search engine query
Background: Data suggest that up to 70% of emergency department (ED) patients decline free HIV screening tests. Although studies have looked at the most popular reasons for this refusal, this cohort has never been examined for variations among different demographic groups.

Objectives: We sought to define the most common reasons for screening refusal and determine any demographic variation among these responses.

Methods: This study was conducted at an urban ED over a 4-month period. A convenience sample of patients presenting to the ED, who refused free HIV screening, was surveyed. The surveys included ten pre-determined choices and an “other” where the refusal reason could be recorded. Demographic information including sex, age, race, and insurance status was characterized real-time tracking system. Trained research assistants, processed, and cultured in standard fashion. We generated automated flags for wound or abscess culture orders using a computerized real-time tracking system. Trained research assistants, present on a semester-based university schedule 7 days/week, monitored orders contemporaneously in the ED, cross-checked catchment, and collected clinical encounter data on a nested convenience sample. Missed orders were obtained through laboratory record review. Research assistants collected data using standardized forms with contemporaneous data entry. We used common descriptive statistics to calculate prevalence data, and multivariate regression to seek clinical associations with MRSA infection.

Results: 500 patients completed surveys. Demographic composition is seen in Table 1. A total of 22 different responses for HIV test refusal were given. The two most common responses were “I’m not at risk” (n=293, 38%) and “I have already been tested” (n=231, 46%). The next closest response was “I don’t want a needlestick” (n=11, 2%). Patients who answered “no risk” tended to be female (OR 0.76, 95% CI 0.5–1.1) and were significantly more likely to be older than 60 (OR 3.7, 95% CI 2.2–4.5). Insurance status showed no difference among patients who answered “no risk”. Patients who answered “already tested” were more likely to be male (OR 1.3, 95% CI 1.0–1.7), aged between 17–39 (OR 2.9, 95% CI 1.6–3.8), African American (OR 1.5, 95% CI 0.5–2.2), and have no insurance (OR 2.3, 95% CI 1.6–3.3). Of the 212 patients who reported time of last test, 187 (86%) had been tested within one year. Sixty-one patients responded both “no risk” and “recent tests”, 16 of whom (26%) had not been tested within 2 years.

Table 1

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age Mean (Range)</th>
<th>Race</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>47 (17–89)</td>
<td>Caucasian</td>
<td>None</td>
</tr>
<tr>
<td>Male</td>
<td>251 (43%)</td>
<td>African</td>
<td>MC/MK</td>
</tr>
<tr>
<td>Female</td>
<td>167 (33%)</td>
<td>Hispanic</td>
<td>Commercial</td>
</tr>
<tr>
<td>Male</td>
<td>145 (29%)</td>
<td>Other</td>
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</tr>
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</table>

303 Reasons for Refusal of Free Rapid HIV Screening in an Urban Emergency Department Setting

Philip Giordano, Kurt Weber, Gina Oviedo, Vanessa Vasquez, Marlene LaLota

1Orlando Regional Medical Center, Orlando, FL; 2Johns Hopkins University, Baltimore, MD; 3Florida Department of Health, Tallahassee, FL

Background: Methicillin-resistant staphylococcus aureus (MRSA) is a common cutaneous abscess infectant. Previous data suggest an overall prevalence of 60%, with inner city populations at increased risk.

Objectives: We aimed to describe MRSA prevalence in purulent skin infections in our inner city setting, and determine clinical predictors.

Methods: In this IRB-approved investigation, we prospectively studied consecutive cutaneous abscess culture results in our two-hospital, inner city, academic emergency departments (EDs) with a combined annual census of 175,000. Specimens were collected, processed, and cultured in standard fashion. We generated automated flags for wound or abscess culture orders using a computerized real-time tracking system. Trained research assistants, present on a semester-based university schedule 7 days/week, monitored orders contemporaneously in the ED, cross-checked catchment, and collected clinical encounter data on a nested convenience sample. Missed orders were obtained through laboratory record review. Research assistants collected data using standardized forms with contemporaneous data entry. We used common descriptive statistics to calculate prevalence data, and multivariate regression to seek clinical associations with MRSA infection.

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<td>Male</td>
<td>145 (29%)</td>
<td>Other</td>
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</table>

304 Unexpectedly Low Prevalence of Methicillin-resistant Staph Aureus in an Inner City Emergency Department: A Prospective Observational Study


1Mt. Sinai School of Medicine, New York City, NY; 2St. Luke’s/Roosevelt Hospital Center, New York City, NY; 3Columbia University, New York City, NY
Results: 1430 cutaneous abscess cultures were ordered from October 2007 to August 2008. Of these, 166 (11.6%) were not resulted (not sent, canceled, etc.), leaving 1264 specimens for study. The sample was 55.8% male with a mean age of 38.6 years, 61% pediatric. Overall, 469 of 1264 cultures were positive for MRSA (32.4%, 95% CI 29–35%). An additional 266/1364 (21.0%, 95% CI 19–23%) were positive for oxacillin-sensitive staphylococcal species. Streptococcal species represented 73/1264 (5.8%, 95% CI 5–7%) and 105/1264 (8.3%, 95% CI 7–10%) were aseptic. Regression analysis of a convenience sample of 238 subjects (with demographic features statistically similar to the overall cohort) suggested robust associations between MRSA and three variables: diabetes (OR 2.8, 95% CI 1.1–6.9), smoking (OR 0.33, 95% CI 0.15–0.77), and recent exposure to MRSA (OR 0.20, 95% CI 0.06–0.65).

Conclusion: In our urban setting, purulent skin infections were positive for MRSA at a rate well below the national average. These data do not support a theory of increased prevalence in inner city populations.

305 Management of HIV-infected Adult Emergency Department Patients With Skin and Soft Tissue Infections - Differential Antibiotic Prescription and Admission Patterns

Yu-Hsiang Hsieh1, Richard Rothman1, Anusha Krishnadason2, Gregory Moran2, and David Talan2
1Johns Hopkins University, Baltimore, MD; 2Olive View-UCLA Medical Center, Sylmar, CA

Background: The number of emergency department (ED) visits for patients with skin and soft tissue infections (SSTIs) has dramatically increased in recent years. The impact of HIV infection on ED presentation and management for those with SSTIs remains unknown.

Objectives: To determine if HIV-infected ED patients presenting with SSTIs had different clinical manifestations and received different ED management compared to those without HIV.

Methods: Multi-site cross-sectional study of adult patients presenting with SSTIs to an ED network, EMERGEncy ID NET. Patients from 12 EDs ≥ 18 years, presenting with SSTIs ≤ 7 days duration, having purulent material available for culture, and not having perirectal abscess were recruited over a one-month period. Demographics, presenting symptoms, laboratory results, and ED management of subjects were collected. Data were analyzed using chi-square and Fisher’s exact tests.

Results: 619 patients were enrolled. The majority were male (61%) with mean age of 38 years. 85% of participants had abscesses, 6% had cellulitis with drainage, and 9% had infected wounds. 31.5% patients were infected with HIV. There were no differences in type, duration of symptoms, mechanism cause, and location of SSTIs between those with HIV and those without; similar rates of MRSA infection were observed. Although proportions of subjects with fever and abnormal vital signs were similar between the two groups, HIV-infected subjects had larger abscesses (width: 3.5 cm vs. 2.4 cm, p<0.05; length: 3.9 cm vs. 2.7 cm, p<0.05).

Both groups received similar management in terms of rates of blood work, imaging, and debridement procedures. Over 90% of subjects in both groups received an antibiotic prescription in the ED; however, HIV-infected subjects were more likely to receive vancomycin (VAC) and fluoroquinolone (FQ) than those without HIV (VAC: 25.8% vs. 11.1%, p<0.05; FQ: 6.5% vs. 0.3%, p<0.05). HIV-infected subjects were also more likely to be admitted to the hospital or an observation unit than those without HIV (29% vs. 15%, p<0.05).

Conclusion: Although HIV-infected patients with SSTIs had similar clinical presentations compared to those without HIV, they were prescribed different antibiotics and were more likely to be admitted. Further studies are needed to determine clinical warranty of the differential management for this subgroup.

306 Validation of Emergency Department Observation Unit Cellulitis Protocol Predictors of Admission

Michael A Ross, Chinedum C Ikpe, Stephen Pitts, Ann Margaret Azcuy, Antoinette Ward, Sharon Friday, Sharon Bohn, Rachel O’Malley, Robert LaMar Cochran, Anwar Dayan Osborne, and Matthew Wheatley
Emory University, Atlanta, GA

Background: Appropriate patient selection in an ED observation unit (EDOU) improves utilization of this limited resource. A prior single center study found female sex and WBC>15 to be associated with admission following EDOU care.

Objectives: To determine and validate clinical predictors of cellulitis treatment failure in an EDOU.

Methods: A cohort study of consecutive cellulitis protocol patients admitted to an EDOU from 9/2009–10/2010 at two urban teaching hospitals. Following initial ED care, selected patients were admitted to the EDOU for appropriate IV antibiotics and serial clinical evaluations under the care of emergency physicians. Patients were not excluded based on sex or WBC>15. Patients with clinical deterioration, inadequate response to treatment, or inability to continue treatment at home were admitted; all others were discharged. All patients were prospectively enrolled in an EDOU database, with additional clinical information gathered later. Patients were analyzed by logistic regression and p-values (sig<0.05) for association with admission by age, sex, WBC>15,000, protocol criteria violation, failure of home antibiotics before arrival, and presence of an abscess or animal bite. Age was censored binary for regression with cutoff at median (46 yr). Odds ratios were adjusted for all variables.

Results: Over the 14 consecutive months, 218 patients (age 47.7 yr; 53% male) were enrolled. Patients received 5.1 hr of initial ED care and 16.9 hr of EDOU care, with 25% subsequently admitted. There was not a significant increased odds of admission among any clinical characteristics, except for male sex (OR 2.62; 95% CI 1.24–5.52) and WBC>15 (OR 2.61 95% CI 0.73–9.31), with only male sex being significant (p=0.02) (see Table). This finding remained when all other clinical subgroups were analyzed.

<table>
<thead>
<tr>
<th>EDOU Cellulitis Admission Variables</th>
<th>Details Discharged (%)</th>
<th>Details Admitted (%)</th>
<th>Combined % Admitted</th>
<th>Adjusted odds ratio (95%C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 158 (100)</td>
<td></td>
<td></td>
<td>28</td>
<td>0.79 (0.39, 1.61)</td>
</tr>
<tr>
<td>Mean age (Std Error)</td>
<td>49.1 (2.6)</td>
<td>47.2 (1.4)</td>
<td>27</td>
<td>2.62 (1.24, 5.52)</td>
</tr>
<tr>
<td>Male sex</td>
<td>76 (48)</td>
<td>39 (65)</td>
<td>34</td>
<td>2.61 (0.73, 9.31)</td>
</tr>
<tr>
<td>WBC&gt;15</td>
<td>25 (16)</td>
<td>11 (18)</td>
<td>31</td>
<td>1.14 (0.40, 3.23)</td>
</tr>
<tr>
<td>Animal bite</td>
<td>25 (16)</td>
<td>8 (13)</td>
<td>24</td>
<td>0.47 (0.11, 1.99)</td>
</tr>
<tr>
<td>Incision and drainage</td>
<td>56 (36)</td>
<td>19 (32)</td>
<td>24</td>
<td>1.71 (0.38, 7.62)</td>
</tr>
<tr>
<td>Abscess</td>
<td>71 (45)</td>
<td>22 (37)</td>
<td>25</td>
<td>0.64 (0.30, 1.37)</td>
</tr>
<tr>
<td>Prior antibiotics</td>
<td>64 (41)</td>
<td>16 (27)</td>
<td>20</td>
<td>0.64 (0.17, 2.42)</td>
</tr>
<tr>
<td>Protocol criteria violation</td>
<td>84 (53)</td>
<td>29 (48)</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

Kevin Jeng1, Charlotte A Gaydos2, Kuan F Chen3, Helen Won4, Justin Hardick5, Lawrence Blyn5, Rangarajan Sampath6, Alexandra Valsamakis7, Gluck Linda8, and Richard E Rothman9

1Duke School of Medicine, Durham, NC; 2Johns Hopkins University School of Medicine, Baltimore, MD; 3Chang-Gung Memorial Hospital, TaoYuan, Taiwan; 4Johns Hopkins School of Medicine, Baltimore, MD; 5Ibis Bioscience, Carlsbad, CA

Background: The 2009 H1N1 pandemic highlighted the need for accurate, rapid tests to differentiate influenza-like illness (ILI) most hospital laboratories relied on referral of specimens to public laboratories for strain testing, which was labor intensive and time consuming. Emergency departments (EDs) are at the forefront of outbreaks, and are best equipped to provide not only on-site diagnosis, but also molecular surveillance for monitoring pathogen evolution.

Objectives: In our laboratory, we studied an RT-PCR coupled to electrospray ionization mass spectrometry (ESI-MS) assay for identification, strain-typing, and genetic surveillance of influenza from different phases of the 2009 influenza outbreak.

Methods: Eighty-five nasopharyngeal aspirates (NPAs) from patients at the Johns Hopkins Hospital who tested positive for influenza by rapid test or culture in the microbiology laboratory were collected between October and December of 2009; samples were strain typed via CDC-approved RT-PCR (gold standard). Residual specimens from these patients were tested in our laboratory using influenza-specific primers for six genes followed by base composition analysis of the resulting amplicons by ESI-MS for pathogen identification. Positive controls (pandemic H1N1, seasonal H3N2) were from Zeptometrix, Inc. ESI-MS results were compared to results from CDC-approved RT-PCR, and sensitivity/specificity were calculated. The data were compared to another recently collected set of clinical samples from earlier in the H1N1 outbreak (April-June 2009) and analyzed for genetic diversity.

Results: 78/85 (92%) NPAs were positive for pandemic H1N1 influenza by gold standard. Sensitivity/specificity of RT-PCR/ESI-MS versus CDC-approved RT-PCR for pandemic H1N1 were 90% (CI 80–95%)/100% (CI 56–100%); total time to detection was 7 hours. Compared to three distinct genotypes observed from samples collected early in the outbreak, 18 distinct genotypes were discovered during the study time period.

Conclusion: RT-PCR/ESI-MS accurately detected and typed influenza samples from the H1N1 pandemic. This method is rapid and has important applications in the ED for patients with ILL. In addition, the spectrometry data revealed an increase in genetic diversity of samples collected over time, demonstrating potential use of this technology for molecular surveillance of emerging influenza strains.

308 External Validation of an Abbreviated Version of the Denver HIV Risk Score

Yu-Hsiang Hsieh1, Jason Haukoos2, and Richard Rothman1

1Johns Hopkins University, Baltimore, MD; 2Denver Health Medical Center, Denver, CO

Background: The Denver HIV Risk Score categorizes patients into groups with increasing probabilities of unrecognized HIV infection. The score was derived and validated in low HIV seroprevalence settings and relies on eight variables (age, gender, race/ethnicity, sex with a male, vaginal intercourse, receptive anal intercourse, injection drug use (IDU), and a past HIV test), some of which may be sensitive and thus not always feasible to collect.

Objectives: We sought to evaluate the performance of an abbreviated and modified version of the Denver HIV Risk Score (excluding one and modifying two sexual contact variables) in a city with known high undiagnosed HIV prevalence.

Methods: We performed a secondary analysis of data collected prospectively between November 2005 and December 2009 as part of an emergency department (ED)-based HIV testing program from two sites: an inner-city ED with 60,000 adult visits/year, and an urban ED with 55,000 visits/year. Non-targeted ED rapid oral fluid HIV testing (OraQuick Advance) was instituted in both sites since November 2005 and June 2008, respectively. Demographics (age, gender, race/ethnicity), past HIV testing history, IDU, and some high risk sexual behaviors including men who have sex with men, were collected by standardized interview. Information regarding receptive anal intercourse and other sexual behaviors were either not collected or collected inconsistently.

Results: The study cohort included 15,184 patients with 114 (0.75%) newly diagnosed with HIV infection. HIV prevalence was 0.26% (95% CI: 0.15% - 0.43%) (n=14/5336) for those with a score <20, 0.94% (95% CI: 0.76% - 1.14%) (n=90/9616) with a score of 20–39, and 4.31% (95% CI: 2.21% - 7.55%) (n=10/232) with a score ≥40. External validation resulted in good discrimination (area under the receiver operating characteristics curve = 0.78).

Conclusion: This external validation of the Denver HIV Risk Score demonstrated potential utility for identifying patients with undiagnosed HIV infection in the ED with limited sexual risk behavior information available.


Wesley H Self, Thomas R. Talbot, Alan B. Storrow, and Theodore Speroff

Vanderbilt University Medical Center, Nashville, TN

Background: A contaminated blood culture increases the cost of a hospitalization by an estimated $5,729. In many emergency departments (EDs), cultures are collected without a standardized protocol (usual care [UC]). Sterile blood culture collection kits (SK) and phlebotomy teams (PT) increase the up-front costs of collecting cultures, but may lead to net cost savings due to lower contamination rates.

<table>
<thead>
<tr>
<th>Collection Method</th>
<th>Patients with ED blood cultures annually</th>
<th>Patients with contaminated cultures</th>
<th>Cost to collect cultures</th>
<th>Cost of contamination</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC</td>
<td>400</td>
<td>296</td>
<td>$16,000</td>
<td>$1,693,476</td>
<td>$64,691,836</td>
</tr>
<tr>
<td>SK</td>
<td>400</td>
<td>109</td>
<td>$39,040</td>
<td>$622,453</td>
<td>$63,643,853</td>
</tr>
<tr>
<td>PT</td>
<td>400</td>
<td>77</td>
<td>$347,472</td>
<td>$443,760</td>
<td>$63,773,592</td>
</tr>
</tbody>
</table>
Objectives: To identify the least costly method of collecting cultures (SK, PT, or UC) in an adult ED that collects cultures on 4,000 patients annually.

Methods: We performed a cost identification analysis from the hospital perspective. The analysis modeled prevalence of bacteremia among patients undergoing culturing, 11%; UC contamination rate, 4.34%; SK contamination rate, 1.55%; PT contamination rate, 1.10%; hospitalization cost with FN cultures, $36,306; hospitalization cost with a TP culture, $32,272; hospitalization cost with a contaminated culture, $19,432; hospitalization cost with TN cultures, $13,703; UC material costs per culture, $2.00; SK material costs per culture, $4.88; annual cost of staffing a PT, $331,472; sensitivity of culture for bacteremia, 1.0.

Results: The SK method resulted in the lowest overall costs (see the Table). Using SK for one year resulted in an additional $23,040 in material costs and 187 fewer patients with contaminated cultures compared to UC, resulting in net savings of $1,047,983 annually. The SK method was less costly than UC if it resulted in ≥4 fewer patients with a contaminated culture annually. In sensitivity analyses, both the SK and PT methods were less costly than UC across all feasible ranges for the variables. If a PT could be staffed for less than $202,000 annually, the PT strategy would be less costly than the SK strategy.

Conclusion: In an adult ED that collects blood cultures on 4,000 patients annually without a standardized protocol for collection and with a 4.34% contamination rate, converting to the SK method is expected to save over $1 million annually.

310 Patient-reported HIV Risk Factors Identify ED Patients With Undiagnosed HIV Infection
Bryn Mumma1 and Brian Suffoletto2
1University of California Davis, Sacramento, CA; 2University of Pittsburgh, Pittsburgh, PA

Background: CDC guidelines recommend universal HIV screening in the emergency department (ED) setting based on data showing that HIV testing based on provider-identified HIV risk fails to identify HIV infection.

Objectives: We hypothesized that ED patients’ self-reported HIV risk factors could be used to identify patients with undiagnosed HIV infection.

Methods: We enrolled a convenience sample of 995 subjects 18–64 years old who presented to an urban, academic ED and were not known to be HIV positive. We collected demographics and HIV risk factors from subjects using a confidential standardized data collection form. We also collected HIV risk factor assessment from ED providers using a similar standardized form. ED providers were blinded to the subjects’ self-reporting of risk factors. We assumed all patients undergoing blood culturing had two cultures collected in the ED and were hospitalized. The total cost was the sum of the costs associated with culture collection and cost of hospitalization. We used the following point estimates from the literature: prevalence of bacteremia among ED patients undergoing culturing, 11%; UC contamination rate, 4.34%; SK contamination rate, 1.55%; PT contamination rate, 1.10%; hospitalization cost with FN cultures, $36,306; hospitalization cost with a TP culture, $32,272; hospitalization cost with a contaminated culture, $19,432; hospitalization cost with TN cultures, $13,703; UC material costs per culture, $2.00; SK material costs per culture, $4.88; annual cost of staffing a PT, $331,472; sensitivity of culture for bacteremia, 1.0.

Results: Three subjects (0.30%, 95% CI 0.00–0.64%) were diagnosed with HIV. All three subjects (0.25 μg/L, CRP < 10 μg/L, no pyuria) and at the end of antibiotic treatment.

Conclusion: Patient-reported HIV risk factors, but not provider-reported risk factors, identify ED patients with undiagnosed HIV infection. Implementation of a risk-based testing strategy could improve the cost effectiveness of ED-based HIV screening. Future studies should evaluate the use of patient-reported risk factors to risk-stratify ED patients with regard to HIV infection.

311 Kinetics of Procalcitonin, C-reactive Protein, and Pyuria in Acute Uncomplicated Pyelonephritis in Women
Cécile Delémont, Stephan Harbarth, Patrick Bovier, Caroline Brossier, François Sarasin, Jean-Michel Gaspoz, and Olivier Rutschmann
Geneva University Hospital, Geneva, Switzerland

Background: Recommended antibiotic treatment duration for uncomplicated acute pyelonephritis (APN) is usually 10 to 14 days. Shorter treatment could improve compliance and decrease the risk of bacterial resistance. Procalcitonin-guided therapy (PCT) has been used to safely reduce antibiotic duration in other infections, but there are no data on biological markers in APN.

Objectives: The objective of this study was to analyze kinetics of PCT, C-reactive protein (CRP), and pyuria in APN.

Methods: Prospective, observational cohort study in an emergency department population of adult women with uncomplicated APN. All patients were treated with a 14-day course of oral ciprofloxacin 500 mg twice a day. PCT, CRP, and pyuria were measured at inclusion, at day 4, and every day until normalization (PCT < 0.25 μg/L, CRP < 10 μg/L, no pyuria) and at the end of antibiotic treatment.

Results: Thirty women (median age 34 y, range 20–63) were included. At inclusion, PCT values > 0.25 μg/L were found only in 37% of patients (median PCT 0.16, IQR 0.06–0.50), CRP > 10 μg/L in 90% of cases (median CRP 96, IQR 32–165). Pyuria was present in all patients. At day 5, PCT was < 0.25 μg/L in 80%, CRP < 10 μg/L only in 17%, and pyuria absent in 76%. Median times to normalization of abnormal values (IQR) were 5 days (4–6.5) for PCT, 8 days (6–10) for CRP, and 5 days (4–5.25) for pyuria.

Conclusion: PCT does not seem to be useful to guide diagnosis and treatment discontinuation of uncomplicated APN due to the small proportion of patients with abnormal PCT values at diagnosis. Although CRP is frequently elevated at diagnosis, the long time to normalization prevents its use for follow-up. Pyuria is a simple marker with an earlier normalization but correlation to clinical resolution is uncertain. None of these markers could be used to guide antibiotic treatment discontinuation in APN.

312 Multi-center Validation of a Clinical Decision Rule to Distinguish Lyme From Aseptic Meningitis in Children in Lyme Disease Endemic Areas
Keri A Cohn1, Amy Thompson2, Samir S. Shah3, Elizabeth Hines3, Todd Lyons3, Elizabeth Walsh3, and Lise E. Nigrovic1
1Children’s Hospital Boston, Boston, MA; 2Nemours/Al Dupont, Wilmington, DE; 3Children’s Hospital of Philadelphia, Philadelphia, PA

Background: In endemic areas, distinguishing Lyme meningitis from other forms of aseptic meningitis often presents a diagnostic challenge. The “Rule of 7’s,” a clinical prediction model proposed by Garro et al. based on work by Avery and his colleagues, classifies children at low risk for Lyme meningitis when each of the following three criteria are met: less than 7 days of headache, less than 70% cerebrospinal (CSF) mononuclear cells, and absence of 7th or other cranial nerve palsy.
Objectives: To test the performance of the “Rule of 7’s” in a multi-center cohort of children with CFSP pleocytosis.

Methods: We performed a retrospective cohort study of children aged 90 days to 19 years evaluated at one of three pediatric emergency departments located in Lyme endemic areas between 1996 and 2010 (study time period varied by center) with CFSP pleocytosis (CFSP white blood cells ≥ 10 cells/mm³) and Lyme serology obtained. Patients with a positive CFSP Gram stain were excluded. Lyme meningitis was defined using the Centers for Disease Control and Prevention criteria (either positive Lyme serology or an erythema migrans [EM] rash). We calculated the performance of the “Rule of 7’s” in our overall study population and in the patients without an EM rash.

Results: We identified 422 children, of whom 117 (28%, 95% confidence interval [CI] 24–32%) had Lyme meningitis and 9 (95% CI 0–1%) had bacterial meningitis. The median age was 9.6 years (interquartile range [IQR] 6.9 - 13.8 years), and 391 (93%) were hospitalized. Of the 130 characterized as low-risk for Lyme meningitis by the “Rule of 7’s,” 5 had Lyme meningitis (sensitivity 108/113 [96%, 95% CI 92–99%]), and negative predictive value 125/130 [96%, 95% CI 93–99%]). In the 376 children without EM rash at presentation, 3 of the 81 patients characterized as low-risk had Lyme meningitis (4%, 95% CI 0–8%).

Conclusion: Patients classified as low-risk by the “Rule of 7’s” were at low risk (4%) for having Lyme meningitis. Low-risk patients may be managed as outpatients while awaiting results of Lyme serology.

313 Comparison of Staphylococcus Aureus From Skin and Soft Tissue Infections in U.S. Emergency Department Patients, 2004 and 2008
David A Talan, Anusha Krishnadasan, and Gregory J Moran
Olive View-UCLA Medical Center, Sylmar, CA

Background: In the past decade, new strains of methicillin-resistant Staphylococcus aureus (MRSA) have emerged as a preeminent cause of community-associated skin and soft tissue infections (SSTIs).

Objectives: In order to assess trends in the prevalence of MRSA as a cause of purulent SSTIs and trends in genetic characteristics and antimicrobial susceptibility profiles of S. aureus and MRSA isolated in infections, we repeated in August 2008 a study of adults with purulent SSTIs presenting to our emergency department network that was initially conducted in August 2004, and compared the findings from these two studies.

Methods: We enrolled adult patients with acute, purulent SSTIs presenting to a U.S. network of 12 university-affiliated emergency departments during August 2006. Cultures were obtained and clinical information was collected. S. aureus isolates were characterized by antimicrobial-susceptibility testing, pulsed-field gel electrophoresis, and detection of toxin genes. The prevalence of S. aureus and MRSA among infecting isolates and genetic characteristics and antimicrobial susceptibility profiles of these isolates were compared to those from a similar study conducted in August 2004.

Results: The prevalence of MRSA was 59% during both study periods; however, the prevalence by site varied less in 2008 (58–84%) compared to 2004 (51–75%). Pulsed-field type USA300 continued to account for almost all MRSA isolates (98%), and most of these in both periods were a single strain, USA300-0114, or the closely-related USA300-0047. Susceptibility to trimethoprim-sulfafoxazole, clindamycin, and tetracycline among MRSA isolates remained greater than 90% in 2008. A higher proportion of MRSA infections were treated with an agent to which the infecting isolate was susceptible in vitro in 2008 (97% as compared to 2004 (57%); absolute difference, 95% confidence interval, 40% [32% to 48%).

Conclusion: Similar to 2004, MRSA remained the most common identifiable cause of purulent SSTIs among patients presenting to a network of U.S. emergency departments in 2008. The infecting MRSA isolates continued to be predominantly pulsed-field type USA300 and susceptible to the non-beta-lactam oral agents that have been recommended for SSTIs possibly caused by MRSA. Clinician prescribing practices have shifted from MRSA-inactive to MRSA-active empiric antimicrobial regimens.

314 A Validation Study of High Volume, Rapid HIV Testing in a South Bronx Municipal Hospital
Yvette Calderon¶, Robert Chin², Ethan Cowan¹, Christopher Brusalis³, Chenyang Zhan¹, and Jason Leider¹
¹Albert Einstein College of Medicine, Bronx, NY; ²Lincoln Medical and Mental Health Center, Bronx, NY; ³Jacobi Medical Center, Bronx, NY

Background: Approximately 21% of the 1.1 million HIV-infected individuals in the US are unaware of their infection. The US Centers for Disease Control and Prevention recommends routine HIV screening in medical care settings such as emergency departments (EDs). Testing models with high patient acceptance that limit the workload of ED providers are needed to reduce the number of new HIV infections.

Objectives: Validate a rapid HIV testing program using integrated video counseling and computer-assisted data collection at the Lincoln Hospital ED in south Bronx, a region of documented high HIV seroprevalence. This testing program previously resulted in high levels of patient satisfaction, increased testing rates, and improved knowledge in an urban, Level I trauma ED (Jacobi Medical Center).

Methods: Prospective cross-sectional study on a convenience sample of medically stable patients presenting to a municipal hospital ED in south Bronx (Lincoln Hospital). Demographics, HIV knowledge, and sexual history were collected for all patients from 6/1/10 to 11/31/10. A previously developed multimedia tool that includes validated HIV pre-test and post-test counseling videos and an HIV counselor were used in the testing process. The number of patients tested, identified HIV infections, patient satisfaction, and HIV knowledge conveyed was determined to assess acceptability and effectiveness of the testing model. Baseline characteristics were analyzed using descriptive statistics. Means and standard deviations were calculated for continuous variable and proportions for categorical variables. Group comparisons were made using chi-square and Student’s t-tests.

Results: 3,970 patients received HIV testing in the Lincoln Hospital ED. Group demographics and outcome measures are compared with those from the Jacobi Medical Center ED during the same time period, and are shown in Table 1 and Table 2, respectively. Many patients underwent testing and found ED testing helpful, and new HIV cases were identified (Table 2).

Conclusion: This study validates an ED-based HIV testing model using computer-assisted data acquisition paired with video counseling and a live counselor to ensure linkage. This model’s proven effectiveness in disparate settings suggests more widespread applicability.

Table 1. Population Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Lincoln</th>
<th>Jacobi</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>33.1 ± 12.2</td>
<td>35.65 ± 14.3</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Male</td>
<td>45.5%</td>
<td>43.0%</td>
<td>0.045</td>
</tr>
<tr>
<td>Hispanic</td>
<td>30.4%</td>
<td>36.1%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>66.7%</td>
<td>52.4%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Table 2. Outcome Measures

<table>
<thead>
<tr>
<th></th>
<th>Lincoln</th>
<th>Jacobi</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted testing</td>
<td>3970</td>
<td>4577</td>
<td>2.17</td>
</tr>
<tr>
<td>HIV infections identified</td>
<td>19</td>
<td>14</td>
<td>0.2673</td>
</tr>
<tr>
<td>Planned to change sex practices</td>
<td>78.4%</td>
<td>90.2%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Learned new HIV information</td>
<td>97.3%</td>
<td>94.7%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Found ED testing helpful</td>
<td>99.5%</td>
<td>98.3%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>
Characteristics of Emergency Department Patients Opting-out of a Non-targeted Rapid HIV Screening Program
Matthew E Prekker, Brandi Gary, Brian Driver, Colleen Kniffin, Steve Dunlop, Andrea Patineau, Ellie Clarkson, Ronald Schut, and Richard O Gray
Hennepin County Medical Center, Minneapolis, MN

Background: In previous studies of emergency department (ED) based rapid HIV screening, 30-50% of eligible patients will opt-out of testing. Limited data are available describing the characteristics of this group, some of whom may only access the health care system through the ED.

Objectives: To compare self-reported personal characteristics and HIV risk factors of ED patients who opted-out of rapid HIV testing versus those who were tested.

Methods: Cross-sectional study of adult ED patients approached for non-targeted opt-out rapid HIV screening in an urban, safety net hospital with 98,000 annual ED visits. Trained research associates carried out brief, standardized interviews with patients who received an HIV test as well as those who opted-out and agreed to be interviewed. Demographic information, previous HIV-testing experience, and a six-item survey of behaviors associated with increased risk for HIV were collected. Interviews were completed before the result of the rapid HIV test was available.

Results: Of 3938 eligible patients, 2811 were screened for HIV during their ED visit and 1127 (29%) opted-out. 350 of the 1127 patients (31%) opting-out of testing agreed to be interviewed. As compared to those tested, a significantly higher proportion of ED patients who opted-out had been previously tested for HIV (80% vs 67%, p < 0.0001) or were born in a foreign country (16% vs 11%, p = 0.006). The two cohorts did not differ by age, sex, or race. Regarding HIV risk factors, a smaller proportion of patients opting-out of testing had more than two sexual partners in the past year (16% vs 24%, p = 0.0004), had a lifetime history of intravenous drug abuse (5% vs 9%, p = 0.009), and reported having sex with someone who is HIV positive or who uses intravenous drugs (3% vs 5%, p = 0.03). The proportion of men who have sex with men did not differ between the groups.

Conclusion: ED patients opting-out of routine rapid HIV screening had more experience with HIV testing and a more favorable HIV risk factor profile than those patients who received an HIV test. While this comparison is reassuring, further work is needed to limit these missed opportunities to screen patients at risk for HIV infection.

Effectiveness of Three Just-in-time Training Modalities for N95 Mask Fit-testing
Joe Suyama, David Jones, and Genevieve Stoler
University of Pittsburgh, Pittsburgh, PA

Background: Use of personal protective equipment can help prevent transmission of infectious diseases. Specifically, N95 masks can provide protection against respiratory pathogens. Fit-testing large groups to these masks can be time- and resource-intensive.

Objectives: Our study was designed to determine the just-in-time (JIT) N95 mask training modality that resulted in the highest rate of success and ease of first time fit.

Methods: 289 medical students were randomized to receive a video demonstration, a slide presentation, or a group lecture instructing how to don a Kimberly Clark™ (KC) or 3M™ N95 mask properly. All modalities were of equal length and content. We evaluated both “ease of fit” and “successful fit”. “Ease of fit” was defined as self-donned in under 30 secs, and “successful fit” was defined as applying the mask correctly on the first attempt. Chi-square testing was used for statistical analysis. This study was IRB-approved.

Results: In the video demonstration group, KC masks were donned easily by 32% and 3M masks easily by 94%, while KC masks were successfully fit by 57% and 3M masks successfully fit by 65% of students. In the slide presentation group, KC masks were donned easily by 38% and 3M masks easily by 89%, while KC masks were successfully fit by 63% and 3M masks successfully fit by 73% of students. In the lecture group, KC masks were donned easily by 58% and 3M masks easily by 89%, while KC masks were successfully fit by 61% and 3M masks successfully fit by 75% of students. By mask type, there were no statistical differences for “ease of fit” or “successful fit” based on training modality with the exception of video demonstration which was significantly worse than the other modalities for “ease of fit” of the KC masks.

Conclusion: By mask type, there were no significant differences between the different JIT training modalities for N95 mask donning. When considering “ease of fit” and “successful fit” as defined above, 3M masks appeared inherently more teachable than KC style masks regardless of JIT training modality.
Background: When used as a probe cover during transvaginal sonography, condoms perforate 1–7% of the time. Nosocomial infections could occur if the probe comes into direct contact with vaginal secretions in two successive patients. One way to reduce this risk would be to cover the probe with two condoms rather than one. The effect of a double condom barrier on image quality is unknown.

Objectives: The objective of this study was to evaluate the quality of transvaginal ultrasonic images using a single vs. a double condom barrier over the transducer.

Methods: This was a prospective study of the image quality of transvaginal sonograms using one vs. two condoms. For each scan the reviewer assessed overall image quality using one vs. two condoms (Lifestyles Ultrasensitive lubricated). All scans were performed on a ultrasound simulator (Blue Phantom) which contains a uterus, bladder, and adnexa amenable to sono imaging. Two physician sonographers each performed twenty scans, half with a single and half with a double condom barrier. Image quality of the uterus, bladder, ovaries, and pelvic structures in general was assessed by each physician using a 0–10 Likert scale from very poor to very good. A third physician, blinded to barrier type, reviewed images from twenty other scans performed in random sequence with one or two condoms. For each scan the reviewer assessed overall image quality and guessed the number of condoms used. Student’s t-test was used to compare ratings of image quality. A proportion with 95% confidence interval was used to score the reviewer’s accuracy.

Results: No difference in image quality occurred when sonographers employed one vs. two condoms to visualize the uterus (8.8 vs 8.6; p = 0.21), bladder (5.7 vs. 5.7; p = 1.0), ovaries (8.1 vs. 7.9; p = 0.14), or pelvic structures in general (6.3 versus 6.6; p = 0.20). Upon blinded review no difference in overall image quality using one vs. two condoms could be appreciated (8.0 vs 7.5; p = .07). The reviewer guessed the correct number of condoms covering the transducer in only 8/20 scans (40%; 95%CI 22.6–61.8%).

Conclusion: This study reveals no difference in image quality when using a single vs. a double condom barrier during transvaginal sonography. Using two condoms would likely result in exceedingly low rates of direct contact between the transducer and the vaginal mucosa, rendering the chance of nosocomial infection from transvaginal sonography vanishingly small.

Background: In 2008, Shapiro et al. published a clinical decision rule (CDR) for blood cultures (BC) in the emergency department (ED). To our knowledge this CDR has not been externally validated.

Objectives: To externally validate a previously derived/validated CDR for obtaining BC in ED patients with suspected infection.

Methods: Design: This was a retrospective cohort study of adult ED patients with blood cultures obtained in a university-affiliated Level I center. The cohort was randomly constituted from all BC patients in an acute care setting does not substantially increase risk above community-based exposure.

Results: Of 193 HCWs surveyed, 41 (21.2%) were positive for antibodies to the 2009 H1N1 virus (median age for HCWs was 40 years). Risk factors independently associated with seropositivity include being female (OR 2.4 [95% CI 1.0, 5.6]), having children under 18 years in the household (OR 2.1 [95% CI 1.0, 4.5]), and being a resident physician (OR 3.0 [95% CI 1.1, 8.1]). Compared to seronegative HCWs, seropositive HCWs did not work significantly more ED shifts (median shifts 20 vs. 22; p = .10). Of the 147 non-HCW controls, 24 (16.3%) were seropositive. Seropositivity.

Conclusion: Following the 2009 H1N1 pandemic the seroprevalence of antibodies to the 2009 H1N1 virus was similar among front line HCWs and non-HCWs. This suggests that working with patients in an acute care setting does not substantially increase risk above community-based exposure.
Mean age was 60.6 (SD 21.3), 486 (46.9%) were 65 y.o. or more, and 547 were male (52.8%). Mean temperature in the ED was 38.7 °C. Respiratory and urogenital systems represented, respectively, 29.2 and 14.5% of infection foci. The CDR sensitivity was 94.0% (95% confidence interval [CI] 83.5–98.8%) and specificity was 27.17% (95% CI 24.3–29.9%). Applying the CDR will reduce BC by 25.7% (204/1025).

Conclusion: We externally validated the CDR for predicting bacteremia in patients with suspected infection in ED. Further implementation study by ED personnel should be sought.

**321 Laboratory Confirmed Gonorrhea and/or Chlamydia Rates in Clinically Diagnosed PID and Cervicitis**

Michael D Zwank¹, Aaron M Burnett¹, and Christopher P Anderson²

¹Regions Hospital, Saint Paul, MN; ²Healthpartners Research Foundation, Bloomington, MN

**Background:** Patients diagnosed with pelvic inflammatory disease (PID) or cervicitis in the emergency department are treated presumptively and aggressively with antibiotics according to conventional recommendations. There is a paucity of current data on the actual rates of gonorrhea and Chlamydia in these patients.

**Objectives:** The goal of this study was to determine the rates of gonorrhea and Chlamydia in emergency department patients who were diagnosed and treated presumptively. The secondary goal examines which clinical criteria were present in those diagnosed with PID who tested positive for one of the sexually transmitted diseases.

**Methods:** We conducted a retrospective chart review of all emergency department patients diagnosed with PID or cervicitis during a 40 month period (1/07–3/10) at an urban academic hospital. Charts were reviewed for laboratory-confirmed gonorrhea or Chlamydia. Of the patients who were diagnosed with PID and were positive for gonorrhea or Chlamydia, the chart was further reviewed for clinical criteria that are often used in the diagnosis of PID.

**Results:** 1469 patients were diagnosed with cervicitis and 343 patients were diagnosed with PID. 136/1469 (9.3%) and 34/343 (10.0%) were Chlamydia only positive. 27/1469 (1.8%) and 15/343 (4.4%) were gonorrhea only positive. 26 (1.8%) and 9 (2.6%) patients were positive for both infections (i.e. co-infections). 189 (12.9%) and 58 (16.9%) were positive for at least one infection. Of the 50 patients with PID who were gonorrhea and/or Chlamydia positive, the following clinical criteria were present: abdominal pain 38/59; abdominal tenderness 30/59; adnexal tenderness 32/59; cervical motion tenderness 46/59; cervical discharge 47/59; vaginal bleeding 8/59; fever 2/59. White blood cell count was obtained in 25 patients and averaged 12.1. ESR was obtained in 3 patients, and CRP was obtained in 2 patients.

**Conclusion:** There is a generally low prevalence of gonorrhea and Chlamydia in this emergency department population diagnosed with cervicitis or PID. There is a very low prevalence of co-infection. Given the current crisis with antibiotic resistance, it is warranted to review the current practice of treatment. Future studies may evaluate if a patient population at low risk of infection may be observed without presumptive antibiotic treatment.

**322 Patients With Pneumonia Are at Special Risk for ICU Upgrade**

Richard Martin and Jonathan Trager

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**Background:** Patients admitted to non-critical care units may require upgrade to the intensive care unit as a result of progression of disease, improper level-of-care decision, misdiagnosis, or new event after admission.

**Objectives:** We examine the characteristics of pneumonia patients upgraded to the ICU within 72 hours of admission.

**Methods:** This is a retrospective chart review of all patients upgraded to the ICU within 72 hours of admission from the emergency department. Patients with pneumonia were compared to other upgraded patients, as well as to a nine-month cohort of pneumonia patients who were not upgraded. Mortality in Emergency Department Sepsis (MEDS), Charlson co-morbidity, Apache II, SIRS and the Pneumonia Severity Index (PSI) were calculated. Multivariate analysis was performed.

**Results:** Of 15,357 non-ICU emergency admissions, 160 patients (1.05%) were upgraded. The majority of deaths were in sepsis patients (76.5%), although only 27% of the upgrades were related to sepsis. Of the sepsis patients, 27/45 (60%) were diagnosed with pneumonia. The mortality rate of pneumonia patients was 37%, versus 44% for patients with other causes of sepsis and 10% of non-sepsis upgrades. By multivariate analysis, the MEDS, Charlson co-morbidity, and WBC were predictive of death on upgrade, with an AUC of 0.79. However, no single death recorded a positive score on all three of these variables. PSI would have directed ICU admission for only 3/10 pneumonia deaths. In comparison, non-upgraded pneumonia patients, those upgraded had higher PSI scores (111 vs 83.1), MEDS (6.4 vs 4.3), and APACHE II (15.55 vs 10.8), but lower SIRS scores (1.85 vs 2.32).

**Conclusion:** For upgraded patients, mortality is greatest for sepsis, with pneumonia being the most frequent diagnosis in upgrade and death. Those upgraded are sicker at baseline than those not upgraded, and some upgrades may be due to improper level-of-care decisions. However, physiologic scoring systems, including PSI, detect a minority of those patients who will require upgrade. Pneumonia patients are at risk to decompensate in-hospital as a matter of natural disease progression.

**323 A Comparison of the Efficacy of Three-day, Twice Daily Nitrofurantoin Versus Three-day, Twice Daily Ciprofloxacin in Females With Uncomplicated Bacterial Cystitis**

Greg R Bell and Brett A Faine

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**Background:** E. Coli infections represent ~90% of urinary tract infections (UTIs) among adults. Our UTI population, similar to national figures, has rising resistance to ciprofloxacin. Nitrofurantoin has a higher coverage rate (> 90%) for E. Coli, with low or no resistance. Only a few studies have tested different durations of nitrofurantoin treatment, and none have directly tested nitrofurantoin versus ciprofloxacin. Thus, we propose to test 3-day, twice daily nitrofurantoin (100 mg/dose) with 3-day, twice daily ciprofloxacin (250 mg/dose) for treatment of uncomplicated UTI.

**Objectives:** Primary outcome: Are there differences between a 3-day, twice daily (100 mg/dose) course of nitrofurantoin and a 3-day, twice daily (250 mg/dose) course of ciprofloxacin in eradicating the initial bacteriuria in females 18–45 years of age who present to the emergency department with uncomplicated acute bacterial cystitis (UBL) Secondary outcomes: Are there differences between drugs in the recurrence of bacteriuria up to 1 month following the ETC visit and/or in the incidence of adverse effects up to 7 days following the ETC visit?

**Methods:** Women with dysuria and frequency and/or urgency of urination and who are non-pregnant with apparently normal urinary tracts are studied. They may have laboratory evidence of pyuria and/or are urine culture positive. Excluded: non-English speaking, pyelonephritis, vaginal symptoms, a history of kidney or liver disease, sepsis, catheterized, immunocompromised, recent antimicrobial treatment for UTI (< 2 weeks ago), or using prophylactic antimicrobials. Randomization: A person not involved in the consenting and intervention processes will perform the randomization of medication and assign coding for each (A or B). Block randomization method to maintain a ratio of 1:1. Blinding Methods: Sequentially numbered envelopes with the card and concealed antimicrobials are locked in the ED. The next envelope is used, assigning (A or B) to the patient’s chart. Outcome data are obtained from the patient’s chart; adverse effects from the patient’s...
Is Long-term Hyperglycemia Predictive of Mortality in Emergency Departments Patients With Suspected Infection

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Background: Prior studies have investigated the role of diabetes and acute hyperglycemia in sepsis, yielding conflicting results. Glycosylated hemoglobin (HbA1c) levels reflect glucose control over time. We are unaware of prior studies assessing the effect of how glucose control over time affects mortality in sepsis.

Objectives: We sought to investigate the association between HbA1c values and in-hospital mortality in emergency department (ED) patients with suspected infection.

Methods: We performed a secondary analysis of a prospective, observational cohort study of patients ≥18 years of age with clinically suspected infection who presented between 9/05-09/06 to a 50,000 visit per year urban, tertiary care ED. We then included any patient who had an HbA1c level measured as part of routine care 90 days prior to or five days after the patient’s ED visit. We compared HbA1c values with a t-test, and performed a logistic regression, adjusting for age, sex, and presence of diabetes.

Results: Of the initial 6,750 patients in the overall cohort, there were 549 patients who met our inclusion criteria. Median age was 64 (IQR 53–77), 49% were female, 56% had preexisting diabetes mellitus (DM), and 30.4% presented with hyperglycemia (defined as glucose >180 mg/dL). Overall mortality was 4.4%. Mean HbA1c values were similar in patients who lived and died (6.86 for both, p=0.99). Logistic regression, adjusted for age, showed no significant relationship between HbA1c and mortality (odds ratio [OR]: 1.03 [95% CI 0.75–1.42], p=0.87), preexisting DM (0.83 [0.34–2.03], p=0.68), or presenting hyperglycemia (1.99 [0.78–5.99], p=0.12). All above results were robust when restricted to those previously known to have diabetes.

Conclusion: In our preliminary study, elevated HbA1c level was not associated with increased in-hospital mortality. Future studies should draw HbA1c levels on a consecutive population of infected patients, enroll a larger sample size, and adjust for other covariates.

Admission Rates for Older Emergency Department Patients With Syncope Are Higher in the United States Than Canada

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Background: The United States (US) spends a greater proportion of its gross domestic product (GDP) on health care than any other country. One possible cause for this may be lower physician risk tolerance in the US. Syncope is a common emergency department (ED) complaint; admission rates for syncope vary widely and hospitalization is often of little benefit, even for higher risk older patients who are often admitted. No previous published manuscript has compared US admission rates for syncope with those in other countries.

Objectives: We sought to compare admission rates for syncope patients >60 and >80 years old in US and Canadian EDs. We chose Canada because the proportion of GDP spent on health care there is 1/3 lower than in the US. We hypothesized that admission rates would be higher in the US than in Canada.

Methods: Design: Retrospective cohort of ED visits. Setting: 20 New York and New Jersey EDs with annual visits from 22,000 to 82,000 and 104 EDs in Alberta with 5,000 to 70,000 average annual visits. Population: Consecutive patients seen by ED physicians in the year 2009. Protocol: We identified patients >60 and >80 years old with primary or secondary syncope ICD code and calculated the rates of hospitalization. We compared rates with Student’s t-test (alpha = 0.05) and calculated 95% confidence intervals (CI).

Results: The US and Canadian EDs had 978,977 and 1,972,924 total visits, respectively. For patients >60 years old, 7676 and 4458 were for syncope; the mean age was 78 and 79 years; and 56%
and 52% were female, respectively. The percent hospitalized was 72.4% in the US and 27.1% in Canada, with a difference of 45.3% (95% CI: 43.7% - 46.9%, p < 0.001). Limiting the analysis to patients >80 years old yielded a similar difference.

Conclusion: We found admission rates for syncope in older patients were higher in the US than in Canada. This may be due to lower physician risk tolerance in the US and also to lack of clinical management consensus and valid decision aids for serious adverse events.

327 Comparing the Accuracy of the Three Popular Clinical Dehydration Scales in Children With Diarrhea
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Background: Dehydration due to acute gastroenteritis is one of the leading causes of mortality in children worldwide. The World Health Organization (WHO) scale, the Centers for Disease Control and Prevention (CDC) scale and the Clinical Dehydration Scale (CDS) were created to estimate percentage dehydration in children with gastroenteritis based on clinical signs. Of these, only the CDS has been prospectively validated against a valid gold standard, though never in a developing world setting.

Objectives: The purpose of this study was to determine whether these clinical scales can accurately assess dehydration status in children when performed by nurses or general physicians in a developing world setting.

Methods: We prospectively enrolled a non-consecutive sample of children presenting to three Rwandan hospitals with diarrhea and/or vomiting. A general physician or nurse documented clinical signs on arrival and weighed the patient using a standard scale. Once admitted, the patient received rehydration according to standard hospital protocol and was weighed again at hospital discharge. The dehydration status of each child was calculated based on each of the clinical scales. Receiver operating characteristic (ROC) curves were created for each of the three scales compared to the gold standard of percent weight change with rehydration, and sensitivity, specificity and likelihood ratios were calculated based on the best cut-points of the ROC curves.

Results: We enrolled 73 children in the study; complete data were available for 48 children less than 3 years old (CDS) and 49 children less than 5 years old (WHO and CDC scale). Based on our gold standard, the children had a mean percent dehydration of 5% on arrival. None of the scales had an area under the ROC curve statistically different from the reference line. The CDS had a sensitivity of 68% and specificity of 45% for significant dehydration; the WHO scale had sensitivities of 79% and 50% and specificities of 68% and 45% for significant dehydration; and the CDC scale had sensitivity of 71% and specificity of 53% for severe dehydration.

Conclusion: In this sample of children, the CDS, WHO scale, and CDC scale did not provide accurate assessments of dehydration status when used by general physicians and nurses in a developing world setting.

329 The Impact of Alcohol Consumption on Road Traffic Injured Patients’ Injury Severity and Hospital Length of Stay in Maputo, Mozambique
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Background: In Mozambique, the burden of road traffic injury (RTI) is increasing, which has been attributed to an increase in motor vehicles, poor transportation infrastructure, alcohol intoxication, and inadequate traffic code enforcement.

Objectives: To determine if alcohol consumption at the time of injury correlates with worse RTI in patients treated by GVK Emergency Management and Research Institute (EMRI) in Andhra Pradesh, India.

Methods: In this prospective study, every other patient evaluated for the chief complaint of RTI over twenty-eight 12-hour periods (equally distributed over each hour of the day and day of week) in Sep-Oct 2009 was included. Real-time demographic and clinical data were collected from prehospital care providers using a standardized questionnaire. Follow-up information was collected at 48 hours and 30 days.

Results: 1588 RTI victims were enrolled; follow-up rates were 67% (48 hours) and 62% (30 days). 90% of patients were adults (age 18-64), 7% children (age <18), and 3% elderly (age >64). 67% of patients were from rural/tribal areas and 93% from lower socioeconomic strata. Average call-to-scene time was 14 minutes (12, SD); scene-to-hospital time was 20 minutes (19, SD). Patient modes of travel included scooter/motorcycle (50%), pedestrian (17%), motorized rickshaw (14%), bicycle (6%), truck (5%), automobile (4%), and bus (2%). 14% of automobile/truck occupants wore seatbelts. 7% of scooter/motorcycle riders and 0% of bicyclists wore helmets. 24% of patients had signs of alcohol consumption while cell phone (<0.5%) and recreational drug (<0.5%) use was infrequent. 6% of patients had abnormal prehospital vital signs. Prehospital examination revealed the following injury rates: extremity (73%), head/neck (35%), chest (4%), pelvic (4%), and abdominal (2%). 11% had an abnormal prehospital neurologic exam. 15% of patients had surgery within the first 48 hours. Mortality ratios prior to hospital arrival, at 48 hours, and at 30 days were 3%, 7% and 8%, respectively. Multivariate logistic regression identified increasing age (OR 1.03; p=0.05), receipt of IV fluids (OR 2.68; p<0.05), and age-adjusted abnormal prehospital vital signs (OR 5.54; p<0.05) as significant predictors of total mortality.

Conclusion: In India, RTIs are frequently encountered in the prehospital setting. The majority of patients are male, of lower socio-economic status, and from rural areas. Alcohol use was common while the use of safety devices was infrequent.

338 Epidemiology of Road Traffic Injuries in Andhra Pradesh, India: A Prospective Analysis
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1Stanford University, Palo Alto, CA; 2EMRI, Hyderabad, India

Background: Few studies have examined prehospital care of patients sustaining road traffic injuries (RTIs) in India.

Objectives: This study describes the epidemiology of patients with RTIs treated by GVK Emergency Management and Research Institute (EMRI) in Andhra Pradesh, India.

Methods: In this prospective study, every other patient evaluated for the chief complaint of RTI over twenty-eight 12-hour periods (equally distributed over each hour of the day and day of week) in Sep-Oct 2009 was included. Real-time demographic and clinical data were collected from prehospital care providers using a standardized questionnaire. Follow-up information was collected at 48 hours and 30 days.

Results: 1588 RTI victims were enrolled; follow-up rates were 67% (48 hours) and 62% (30 days). 90% of patients were adults (age 18-64), 7% children (age <18), and 3% elderly (age >64). 67% of patients were from rural/tribal areas and 93% from lower socioeconomic strata. Average call-to-scene time was 14 minutes (12, SD); scene-to-hospital time was 20 minutes (19, SD). Patient modes of travel included scooter/motorcycle (50%), pedestrian (17%), motorized rickshaw (14%), bicycle (6%), truck (5%), automobile (4%), and bus (2%). 14% of automobile/truck occupants wore seatbelts. 7% of scooter/motorcycle riders and 0% of bicyclists wore helmets. 24% of patients had signs of alcohol consumption while cell phone (<0.5%) and recreational drug (<0.5%) use was infrequent. 6% of patients had abnormal prehospital vital signs. Prehospital examination revealed the following injury rates: extremity (73%), head/neck (35%), chest (4%), pelvic (4%), and abdominal (2%). 11% had an abnormal prehospital neurologic exam. 15% of patients had surgery within the first 48 hours. Mortality ratios prior to hospital arrival, at 48 hours, and at 30 days were 3%, 7% and 8%, respectively. Multivariate logistic regression identified increasing age (OR 1.03; p=0.05), receipt of IV fluids (OR 2.68; p<0.05), and age-adjusted abnormal prehospital vital signs (OR 5.54; p<0.05) as significant predictors of total mortality.

Conclusion: In India, RTIs are frequently encountered in the prehospital setting. The majority of patients are male, of lower socio-economic status, and from rural areas. Alcohol use was common while the use of safety devices was infrequent.
distributed between the alcohol and non-alcohol groups. Mean RTS was 7.41 (SD-0.71) for those who consumed alcohol and 7.59 (SD-0.52) for those who did not (n=36, n=39, respectively). Mean ISS was 4.97 (SD-3.21) and was significantly higher for patients who consumed alcohol (p=0.017). Mean total LOS was 10.9 days (0.6 ICU, 0.1 step-down, 10.2 wards) for those who consumed alcohol, and 7.71 days (0.25 ICU, 0.04 SUD, 8 wards) for those who did not. Alcohol consumption was correlated with increased ICU (p=0.03) and overall LOS (p=0.04).

Conclusion: RTI patients who consumed alcohol at the time of injury had worse injuries by ISS and had significantly longer ICU and total LOS. Given the significance of alcohol as a risk for worse injury, establishing a protocol for blood alcohol testing is a recommendation for HCM.

**Background:** The goal of an emergency medical services (EMS) system is to prevent needless death or disability from time-sensitive disease processes. Despite growing evidence that time-sensitive illnesses contribute significantly to mortality in poor countries, there has been little focus on the development of EMS systems in poor countries.

**Objectives:** The objectives of this study were to understand the utilization pattern of the EMS system and to elucidate the perspectives of health staff and community on the newly implemented EMS system in Ruhira, Uganda.

**Methods:** Five months of ambulance logs were reviewed and EMS systems data were extracted. In depth interviews (IDIs) and focus groups (FGs) were held to determine health care worker, community, and village leader perceptions of the newly implemented EMS system in Ruhira, Uganda.

**Results:** In total, 207 cases were reviewed, 53 IDIs were conducted, and 119 community members participated in FGs. The functioning EMS system was described. Mean age for adult activations was 23 years of age (range: 19–30 years old). 77.8% of all activations were for female patients. There was a significant difference in age distribution by sex (p<0.05). 66% of all transfers were for chief complaints that were obstetric-related, while 12% were related to malaria. Among men, 34% and 28% were related to malaria and trauma, respectively. 52% of all obstetric transfers, 65% of malaria transfers, and 62% of all trauma transfers were from regional to provincial hospitals. There was no difference of the call to arrival on scene time, the time to scene or the scene to treatment time during the day and night (p>0.05). IDIs with health care workers and FGs with community members revealed that individuals felt that they were more empowered to address their health needs and that poverty and mortality were decreased due to the creation of the EMS system. Areas for improvement included the need for increased training on emergent conditions, for professionals to assist while an ambulance is en route, and on triage protocols at call center. Cost-benefit analysis revealed a cost of $89.95 per life saved.

**Conclusion:** EMS systems are greatly needed in rural Africa. Contrary to current belief, they are affordable and highly utilized for life-threatening non-traumatic complaints. Communities view EMS as feasible, acceptable, and an essential component to the primary health care system.

**Emergency Response in Resource-Poor Implemented EMS System in Rural Uganda**

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**Pediatric Preparedness of Lebanese Emergency Departments**

Rasha Sawaya1, Peter Dayan1, Hachem Nasr1, Martin Pus1, and Amin A Kazzi1

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**Background:** While emergency medicine is advancing in Lebanon, there are currently no data to determine the pediatric preparedness of Lebanese emergency departments (EDs).

**Objectives:** To assess the preparedness of Lebanese EDs to care for children by determining their number, regional location, and characteristics.

**Methods:** We surveyed all hospitals in Lebanon that care for children in an ED setting between 09/2009 and 08/2010. The survey, in English or Arabic, included questions on demographics, ED characteristics, equipment, staffing, support services, and policies related to pediatric patients. The survey was based on the AAP 2001 ED Pediatric Preparedness guidelines and WHO Guidelines for Essential Trauma Care.

**Results:** General: 115 EDs were identified that care for children; 72 (63%) responded. The majority of EDs were in urban (54%), privately funded (73%), and non-teaching (70%) centers, with fewer than 100 inpatient beds (65%). 94% of EDs had <20,000 patient visits/year. Only one ED (2%) had a separate unit to care for children. Staff who care for children in EDs: 66% had faculty physicians available, varying from 1–24hr/day; 34% had none. 92% of the EDs had a nurse available to care for all patients in the ED 24/7; 35% had one specifically for children. The training of physicians who cared for children in the ED varied within and between the different institutions. Across EDs, physicians caring for children had the following training: general pediatrics (49%), emergency medicine (40%), and internal medicine (33%). Interestingly, 27% of the EDs also had times at which care for children was provided solely by a physician who finished medical school but had no further training. Two hospitals (3.2%) reported a pediatric ED trained physician. 75% of the EDs had pediatric subspecialists available for consultation. Equipment: Most EDs had pediatric blood pressure cuffs (85%), intravenous catheters (90%), and endotracheal tubes (96%). 41% had intra-osseous needles. Support services: 98% of EDs had 24/7 access to x-ray machines, 82% to CT scans, and 92% to a laboratory that processed micro tubes. However, only 51% had access to a blood bank.

**Conclusion:** This snapshot shows varied pediatric preparedness of Lebanese EDs. Further studies are needed, looking more specifically at clinical outcomes, while national initiatives take place to improve pediatric emergency care via education and development efforts.

**Pediatric Preparedness of Lebanese Emergency Departments**

Rasha Sawaya1, Peter Dayan1, Hachem Nasr1, Martin Pus1, and Amin A Kazzi1

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**Conclusion:** This snapshot shows varied pediatric preparedness of Lebanese EDs. Further studies are needed, looking more specifically at clinical outcomes, while national initiatives take place to improve pediatric emergency care via education and development efforts.

**Attitudes Towards Use of Helmets by Motorcyclists in the Dominican Republic**

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**Background:** Motorcycle-related traumatic brain injury in developing countries is a significant health problem, due in part to low rates of helmet use.

**Objectives:** We sought to identify attitudes and beliefs about helmet use among residents of the Dominican Republic who ride motorcycles without helmets.

**Methods:** A qualitative research study was conducted on a convenience sample of adult patients and visitors in a public, urban emergency department in Santiago, Dominican Republic. Those included reported riding motorcycles without helmets before presenting. Questions examined how subjects used motorcycles,
beliefs about helmets, and history of any prior collisions. Interviews were conducted in Spanish, audio-recorded, and transcribed into English with a research associate familiar with area culture. Two investigators, trained in qualitative methods, organized relevant text into repeating ideas, themes, and theoretical constructs using an iterative coding strategy. Data were collected and analyzed until achieving theoretical saturation.

Results: Saturation was achieved by interviewing 24 subjects residing in Santiago and surrounding rural areas. Of these, 12 were women. Most understood helmets protect against head injury. Subjects, including those having had prior motorcycle collisions, believed their risk of head injury to be low, stating helmets are not needed when driving short distances or in rural areas. Women often ride as passengers and expressed “only the driver wears a helmet.” Perceived barriers to helmet use include cost, drivers not having one for passengers, unattractiveness, and obscured vision. Subjects considered a national law mandating helmet use by motorcycle drivers to be ineffective, stating tickets are easily avoided due to limited enforcement at predictable areas and times. Responses are explained in part by the Health Belief Model, which postulates how perceived risk, barriers, and cues to action predict health behaviors. Subjects offered suggestions such as mandated bundling of helmets with motorcycle purchases and requiring passengers to wear helmets, and for motorcycle taxis to provide helmets for passengers.

Conclusion: Results identified barriers to and identified innovative means for increasing helmet use among Santiago motorcyclists. Future work will be undertaken to design and evaluate policy as informed by these research findings.

333 Why Do Patients Leave the Emergency Department in India Against Medical Advice?

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Background: Leaving the emergency department (ED) against medical advice (AMA) is associated with poor patient outcomes. In the United States, patients leave AMA because of long wait times and a perception of poor service. To date, no study has assessed the reasons for which patients in India leave EDs AMA.

Objectives: This study attempts to determine why patients leave AMA from one private hospital ED in India.

Methods: A prospective ED-based cross-sectional study of patients leaving AMA at a private hospital with 10,000 ED visits per year in Durgapur, India, population 500,000, over an eight-month period. The confidential survey was given to a convenience sample of eligible patients.

Results: The majority of 55 respondents were homemakers, students, and service workers. The range of diagnoses of study participants was diverse, and included general surgery, infectious disease, trauma, psychiatric, and cardiac patients. Forty-six (84%) participants left for the ED AMA for financial reasons, and 39 (71%) felt that the bill would represent more than 25% of their annual income. Sixteen (29%) respondents identified themselves as the primary decision-maker in leaving AMA, as opposed to family or friends. A statistically significant proportion of those who reported that they made their own decision to leave AMA were male (p=0.01); none were female. All females (19, 100%) left for financial reasons as compared with 27 (75%) males (p<0.001). Forty-four (80%) of those surveyed reported not having private insurance and 27 (75%) of those with private insurance identified financial restrictions as the reason for leaving AMA. Patients with lower annual incomes left for financial restrictions a greater percentage of time: 8 (100%) respondents with an annual income of less than 50,000 rupees (~$1,100 USD), 18 (90%) between 50,000 rupees and 100,000 rupees (~$2,200 USD), and 20 (74%) above 100,000 rupees. Fifty-four (96%) study participants stated that they would seek medical attention elsewhere and all stated that doctors did explain the consequences of leaving AMA.

Conclusion: A vast majority of patients who leave AMA from this hospital in India do so because of financial challenges. Income and gender are both correlated with the likelihood to leave AMA based on financial restrictions. It is important to note that most private hospitals in India require advance payment for even the most emergent medical services.

334 Factors Influencing Ambulance Response Times in Karachi, Pakistan

Omer Moin and Junaid A Razzak
Aga Khan University, Karachi, Pakistan

Background: Ambulance response time is considered a quality indicator for emergency medical services (EMS). In Pakistan, it is only recently that EMS systems have begun to be established. Little data exist with regards to response time and factors that affect the efficiency of ambulance response.

Objectives: The aim of this study was to determine response times of ambulances to all emergency calls made to a single ambulance service in Karachi, Pakistan, and, if necessary, contribute to the improvement of them.

Methods: This was a cross-sectional study conducted by the Aman Foundation in Karachi, Pakistan. Karachi is one of the largest cities in the world with a population of 16 million. Information regarding all ambulance calls was recorded in January 2010, June 2010, and November 2010. The response time was measured with a delayed response defined as more than 7 minutes from the time when the call was received in the control room/dispatch to the time the ambulance reached the patient. The response time was correlated with the number of ambulances on the road as well as the capacity in the control/dispatch room.

Results: The Aman ambulance service responded to 4336, 6084, and 7738 calls during the months of January, June, and November, respectively, showing a volume growth of 78% over the study time. The numbers of calls with delayed response were 12%, 11%, and 25.5% during the three periods of study. During this time period the number of ambulances more than doubled (January - 40 ambulances, November - 93 ambulances). While ambulance numbers increased, the dispatch/control room capacity remained static.

Conclusion: Despite increasing the number of ambulances by more than twice their original amount to counter a similar rise in the number of emergency calls, delayed ambulance response times were also seen to increase by more than double. This may be due to a bottle neck effect in the control room, where only one wireless frequency was used.

335 Determinants of Cesarean Sections in West Bengal, India

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Background: Globally, over the past 35 years, the rate of delivery by cesarean section (c-section) has increased dramatically; the World Health Organization reported in 2010 that c-sections take
place in 30% of U.S. births. According to a survey by the International Institute for Population Sciences, in 2005 - 06 in West Bengal, India the rate of delivery by c-section was 26.8% in urban areas and 5.8% in rural settings.

Objectives: This study examines the factors influencing the seemingly high c-section rate at one hospital in Durgapur, West Bengal, India.

Methods: Beginning in January 2010, study investigators reviewed the charts of the first 100 women who gave birth at this 250-bed tertiary urban hospital in Durgapur. A trained investigator then contacted all patients who delivered by c-section and invited them to complete a survey about c-sections.

Results: During the study period, 78 (average age: 26.3 ± 4.6 years) of the 100 births in this hospital were by c-sections. All 78 women agreed to complete the survey. 63% (49/78) of the c-sections were planned and 37% (29/78) were emergent. Of the planned c-sections, the procedure was the woman’s idea in 47% (22/47) of cases and the doctor’s idea in 45% (21/47) of cases. In cases where the c-section was the woman’s idea she cited it was for convenience 36% (8/22) of the time, to avoid pain 32% (7/22) of the time, and because of previous c-sections/deliveries 23% (5/22) of the time. Of the 61 women who answered a question regarding the selection of their c-section date, 36% (22) chose the date based on personal convenience, 28% (17) chose the date out of convenience for their family, 20% (12) chose the date based on astrological beliefs, and 8% (5) chose the date based on when it was convenient for their physician. 37% (22/60) reported c-section as their preferred method of delivery. 73% (56/77) believe it is very safe to go for a c-section while 14% (11/77) believe one should have a c-section only if there is no other option.

Conclusion: The frequency of c-sections in this hospital is greater than the reported global and Indian averages. While the reasons behind this are complex, they are likely to include convenience, misperceptions about the risks and benefits of c-sections, and astrological/religious beliefs. Study limitations include a small sample size and the fact that many women in West Bengal give birth at home where vaginal delivery is the only option.

The Use of Gastric Lavage in India

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Background: According to the American Academy of Clinical Toxicology, “gastric lavage (GL) should not be employed routinely, if ever, in the management of poisoned patients.” Several clinical studies have demonstrated that the risks, which include hypoxia, infection, dysrhythmia, perforation, and electrolyte imbalance, far outweigh the benefits of this procedure. The utility of GL decreases as a function of time and is minimally effective more than 1 hour after toxin ingestion. Nonetheless, observational experience suggests that this procedure is still widely practiced in response to toxic ingestion in India.

Objectives: This study attempts to quantify the prevalence and scope of GL use among health care providers in India.

Methods: A convenience sample of 81 acute care hospital-based health providers practicing throughout India were anonymously surveyed at the 12th International Conference of the Society for Emergency Medicine (INTEM) in Ahmedabad, India, November 10-14, 2010. The 81 respondents included 51 physicians, 19 residents, 3 medical students, 1 nurse, and 7 who did not specify their professional designation. The survey included questions on the frequency and scope of GL use for each provider.

Results: Sixty-eight respondents (86%) claim that they use GL in treating at least 50% of their poisoned patients. Fifty-five (70%) claim that they would use GL more than 1 hour after the ingestion of a poison, and 19 (24%) claim they would use it up to 6 hours after ingestion. Sixty-nine (87%) use a tube smaller than 36-40 French, the only size large enough to remove solids. In response to a question about circumstances in which they would not use GL, 78 respondents (96%) claim they would not use lavage to treat ingestion of caustic or corrosive substances; however, substantially fewer respondents claim they would not use lavage in cases of hydrocarbons (31, 38%), large objects (22, 27%), or sharp objects (47, 58%).

Conclusion: Despite extensive evidence demonstrating little benefit and the significant risk of GL in the management of poisoned patients, it is still practiced in India. Further research should explore why this consensus-based practice is still the standard of care when safer and more effective, evidence-based alternatives are available.

At-risk Drinking and Smoking Among Hispanic Patients Visiting an Urban Emergency Department

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Background: Patients in medical settings are not routinely screened for risky alcohol use and smoking, although such screening could lead to significant improvements in morbidity and mortality. For many patients an emergency department (ED) visit represents the only point of contact with the health care system, and as such represents an important opportunity to provide patients with access to alcohol and tobacco screening and interventions.

Objectives: To screen a convenience sample of ED patients for at-risk drinking and smoking.

Methods: Medically stable adult ED patients completed a self-administered, computer-based screening program using the Alcohol Use Disorders Identification Test (AUDIT) to identify patients who were currently drinking in excess of NIAAA safety guidelines. Demographics, smoking status, and variables relevant to acculturation were also collected.

Results: Five hundred and seventeen patients participated, 62% Hispanic, 37% male; 31% of patients screened positively for at-risk drinking and 26% were smokers. Among Hispanic patients, rates of smoking and or drinking were lower among patients who speak Spanish at home (31.2%, 95% CI 14.0% - 48.4%) compared to those who spoke English at home. Although not statistically significant, Hispanic patients had slightly higher rates of overall smoking (27% Hispanics v 22% of non-Hispanics) and at-risk drinking (32.3% Hispanic patients v 28.6% non Hispanics), and white non-Hispanic patients were slightly more likely to report use of risky alcohol consumption and smoking as compared to Hispanics (28.6% v 12.8%).

Conclusion: Hispanic patients who were less acculturated (speak Spanish at home) reported less smoking and drinking which may reflect a negative effect of acculturation previously noted in the literature. This study demonstrates that patterns of use among Hispanic patients are different than among non-Hispanic patients and may be influenced by acculturative differences, which warrants further investigation. Additionally, since Hispanic patients in this ED sample reported more at-risk drinking and smoking compared to their non-Hispanic counterparts, further research with a larger sample size is warranted to explore this trend.

Patients With Mental Illness in the Emergency Department: A Population-based Analysis of Their Care Relative to Other Patients, and the Effect of Crowding

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Background: Patients with mental illness are common in the emergency department (ED). It has been suggested that these patients wait longer for care than other ED patients.

Objectives: To determine whether patients with mental illness experience greater delays to care than patients with non-mental health diagnoses, overall, and during periods of ED crowding.

Methods: We conducted a population-based retrospective cohort analysis of all patients with a primary ED diagnosis of mood disorder or schizophrenia seen at the 155 non-pediatric EDs in Ontario, Canada, between April 2007 and March 2009. We compared their wait times and ED triage scores to those of other patients seen in the ED, overall and during three levels of ED crowding. Wait times included time to see a physician, and time from the decision to admit to ED departure (“decision to transfer”). Using quantile regression analysis, we assessed the adjusted difference in wait times for patients with a mental illness compared to other ED patients.

Results: There were 122,820 ED visits made by 73,641 patients with a mood disorder or schizophrenia. Most patients were assigned a triage score of 3; overall scores were higher priority than for other ED patients, including during crowding. Median times to see a physician were longer in all triage categories except category 3, compared to other ED patients. Decision to transfer was significantly shorter in mental illness patients, overall and within triage groups. These patients waited an adjusted 18 minutes longer (p<0.001) to see a physician than other ED patients, but there was no difference in adjusted decision to transfer time (p=0.79). During ED crowding, patients with a mental illness experienced shorter wait times relative to other ED patients: an adjusted 6, 35, and 46 minutes less than other ED patients to see a physician during mild, moderate, and severe ED crowding, respectively, and 54, 120, and 105 minutes less for transfer to a bed.

Conclusion: Patients with a mental illness-related complaint receive relatively high priority triage, and are not “down-triaged” during ED crowding. They wait about a quarter of an hour longer to see a physician compared to other patients, but no longer to get a bed, and the long waits associated with ED crowding do not affect them disproportionately. Patients with mental illness do not receive markedly worse ED care.

339 Self-reported Attention Deficit Hyperactivity Disorder Symptoms Among Resident Physicians: Do Emergency Medicine Residents Have More Attention Deficit Hyperactivity Disorder Than Other Specialties as They Often Claim?

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Background: Emergency medicine (EM) physicians often anecdotally claim that “we are more ADHD” than other specialties. There are characteristics of the specialty which would, on the surface, allow persons with adult attention deficit and hyperactivity disorder (ADHD) to minimize performance loss as compared to other medical specialties.

Objectives: To date there have been no studies documenting ADHD prevalence among different medical specialties. We believe that EM resident physicians are more likely to express ADHD symptoms than residents in other specialties.

Methods: An anonymous e-mail linked online survey was constructed using two adult self-reporting ADHD exams: the validated Adult ADHD Self-Report Scale (ASRS-v1.1) and the scalable Jasper Goldberg (JG) Adult ADD Questionnaire. Surveys were sent to all accredited residency training programs for 16 different medical and surgical specialties in the United States during 2010. Chi-square testing was performed to compare the ADHD symptom difference between EM and other specialties. Logistic regressions were conducted to adjust for age and sex. The two-tailed P values were calculated with p<0.05 considered for statistical significance.

Results: Survey responses were received from 5,971 residents with 3,019 surveys complete enough for analysis. The 16 fields were divided into four groups for analysis: EM [n=409], primary care [n=1353], medical specialties [n=836], and surgical specialties [n=504]. The ADHD prevalence among EM residents surveyed was 21.03% (ASRS tool) and also endorsed a greater degree of symptoms (JG tool p<0.0001). When age and sex were controlled, EM residents were more likely than other residents to endorse ADHD symptoms (OR for ASRS tool 1.497, 95% CI 1.15–1.95; p=0.003 and for JG tool 2.81, 95% CI 1.38–5.72; p=0.005).

Conclusion: EM residents in our sample were significantly more likely to both generally endorse ADHD symptoms and endorse a higher degree of ADHD symptoms compared to residents in other fields. As these findings represent self-reported ADHD symptoms, further investigation using formal diagnostic procedures would be required to document true ADHD prevalence rates.

340 Feasibility of a Computerized Screening Program to Identify At-risk Alcohol Users in an Urban Emergency Department

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Background: Most at-risk drinkers do not ever seek out alcohol treatment services; however, each year 115 million people visit an emergency department (ED), creating an opportunity to reach the greatest number of people who may otherwise have never been asked about their alcohol use or offered screening and referral for treatment. Prior research shows that as many as 46% of ED patients have recently consumed alcohol and a significant number of the 31.6 million ED injury-related visits are alcohol-related.

Objectives: In this study we describe the results of 517 patients who completed a computerized alcohol screening instrument (CASI) program during an ED visit.

Methods: Research assistants screened a convenience sample of medically stable adult ED patients, and brought the CASI touch screen laptop to the patient’s bedside. CASI content (provided by www.alcoholscreening.org) consisted of an alcohol use screening identification test, personalized normative feedback profile, alcohol education, and treatment referrals (when indicated).

Results: Six hundred and forty-four were approached, 517 participated, average age 37 (range 21–85), 62% Hispanic, 37% male, 42% African American, 11% white, 2% American Indian. 73% used computers regularly at home. Reason for ED visit: pain related condition (49%), sickness (17%), injury (15%). Feasibility data: 97% of patients who started the program were able to complete the entire program and 95% correctly identified their alcohol risk level after participating in the CASI program. 33% of patients were current at-risk drinkers. 93% of patients reported the computer program was easy to use, 92% felt comfortable using a computer to receive this information, 93% felt others would be helped by using this program, 82% felt the information was useful to them, and 90% reported that using the program got them thinking about their alcohol use.

Conclusion: This study demonstrates the feasibility of an ED-based alcohol screening program as being both acceptable to patients and effective in educating them about their alcohol risk level. Brief alcohol screening and intervention programs can be
Background: It is well known in the medical community that national cardiac arrest survival rates average less than 10%. However, what the public knows about cardiac arrest survivability has rarely been explored. Furthermore, depictions of cardiac arrest on syndicated television shows are generally favorable and may skew the public perception of survival rates.

Objectives: The twofold research objectives were to determine the public’s perception of survivability in cardiac arrest and identify predictors of this perception. It is hypothesized that the public will over-estimate the percentage of people surviving cardiac arrest.

Methods: Data were collected in a national telephone survey using a stratified, clustered, random digit dial telephone sample. The outcome variable consisted of respondents’ perceptions of the percentage of people who survive a cardiac arrest. A number of variables including age, time to hospital, and viewing emergency medical services (EMS) professionals as heroic) were analyzed for significant effects in an ordinary least squares (OLS) regression model.

Results: 1,051 adult respondents completed the survey (62.5% response rate). On average, respondents report that 54.3% (SD = 26.2, median = 60.0) survive a cardiac arrest event. A multivariable OLS regression model (F = 7.55; p = 0.000) indicated that respondents increase age (b = –0.144, p = 0.006), minutes to hospital (“How many minutes does it take you to get to the hospital?”) (b = –0.171, p = 0.036), and viewing EMS professionals as heroic (b = 1.578, p = 0.001) produced significant effects on respondents’ perceptions of survival rates for cardiac arrest: older respondents and those reporting a longer time to get to the hospital think less people survive cardiac arrest. Respondents viewing EMS professionals as heroic thought a higher percentage of people survive cardiac arrest.

Conclusion: This study assessed the public’s perception of cardiac arrest survival rates. Findings point to the public being misguided as to cardiac arrest survival rates. Informing the public of more realistic survival rates can help EMS professionals garner a more favorable expectation in cardiac arrest calls and provide impetus in promoting bystander CPR.

342 Urban ED Experience With Patients With Suicidal Ideation: Recurring Presentations and Rare Suicidality

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Background: Suicide is the 11th leading cause of death in the United States. The overall death rate is 10.9/100,000 with 8–25 attempts per completed suicide.

Objectives: To compare the risk of death in those presenting to an urban emergency department (ED) with suicidal ideation with an ED cohort of patients with an ED discharge from a non-psychiatric illness who subsequently died when matched for similar co-morbidities and sociodemographic factors.

Methods: Setting: Urban 950 bed hospital with an annual ED census of 80,000. This was a retrospective data collection using Azyxxi database (Smith and Feeid, Microsoft, Redmond WA). Included patients presented with a triage complaint or ED diagnosis of suicide or spilling variants between 2002–2007. An SI cohort of 3742 patients was identified. The cohort was then screened against the Social Security Death Registry (http://ssdi.rootsweb.com/cgi-bin/ssdi.cgi) to obtain mortality statistics. A subcohort of 108 patients with a positive match for death on the SSNDR (Death Cohort) was identified and sociodemographics and co-morbidities characterized. True suicides as primary cause of death were then ruled in by cross-referencing of this subcohort with the District of Columbia’s Medical Examiner’s Office.

Results: Suicide ideators have a relatively low incidence of mortality following discharge (0.5%). The mean time until death was 5.1 (± 2.8) years from the first ED visit, and 3.0 (± 2.5) years from the first ED presentation with SI. Chi-square analysis of the SI cohort and the matched cohort indicated that the age of patients in the death cohort was on average 5.7 years older than in the SI cohort (p=0.01), with a higher prevalence of Caucasian patients (p=0.02). There was no significant difference in sex between the two cohorts (p=0.839). Patients with SI have a higher number of ED visits than the matched cohort (13.4–17.1 vs. 4.3). There were 12/109 records with confirmed suicide as the primary cause of death.

Conclusion: Patients presenting with SI have a higher number of ED visits. The relatively low mortality rate of this cohort of patients suggests a need to re-evaluate risk stratification for patients presenting with this condition.

343 Construct Validity of the Emergency Department Sickle Cell Assessment of Needs and Strengths

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Background: The Emergency Department Sickle Cell Assessment of Needs and Strengths (ED-SCANS) is a decision support tool developed by a multi-disciplinary team led by an ED nurse/
health services researcher. It includes seven algorithms, rigorously developed, to guide optimal management of adults with sickle cell disease (SCD) in the ED. Decision #7 identifies the need for psychiatric or social service referrals. We evaluated construct validity of Decision #7: Referrals.

**Methods:** Thirty adult patients with SCD were recruited for participation during an ED visit, hospitalization, hematology clinic visit, or from the community (flyers mailed to members of the Sickle Cell Association of Illinois). A separate interview was arranged for all subjects when they were not in the hospital. To identify the need for a psychiatric referral, the PI administered questions from Decision #7 of the ED-SCANS: (1) Do you generally feel anxious? and, (2) During the last week have you felt depressed? Eight ED-SCANS questions are used to screen for a social service referral and three examples include unstable living/residential situation, homeless, and lack of heat/water/electricity. The research assistant administered the Center for Epidemiologic Studies-Depression measure (total score=0–60), the Spielberger Trait Anxiety Scale (total score=0–80), and the Patient-reported Outcomes Measurement Information System Social Support and Social Function measures. Sensitivity, specificity, and area under the curve of the ED-SCANS screening questions are reported for anxiety and depression. A Pearson correlation coefficient was calculated to measure correlation between ED-SCANS screening questions for social service referral and the Patient-reported Outcomes Measurement System (PROMIS) measures of social roles and function.

**Results:** Thirty patients (50% male, mean [SD] age 41 [11]) completed the follow-up interview. The sensitivity, specificity, and AUC of the ED-SCANS were 0.64, 0.88, and 0.76 for the anxiety question, and 0.85, 0.88, and 0.86 for the depression screening question. There was no correlation between the ED-SCANS social service referral and PROMIS measures.

**Conclusion:** The ED-SCANS screening questions were valid measures of the need for a psychiatric referral. The PROMIS measures did not represent the construct of identifying a social service referral need.

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**344 A Retrospective, Cross-sectional Analysis of United States Adult Emergency Department Visits at Which Antipsychotic and Anxiolytic Sedative-hypnotic Medications Were Utilized: Data From a Nationally Representative Sample**

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**Background:** There is limited research describing the epidemiology and indications pertaining to emergency department (ED) utilization of antipsychotic (AP) and anxiolytic sedative-hypnotic (ASH) medications. Such information could provide guidance in the management of behavioral emergencies.

**Objectives:** To describe United States (U.S.) adult emergency department (ED) visits at which AP and ASH medications were utilized and to identify predictors of combination therapy.

**Methods:** Data from the National Hospital Ambulatory Medical Care Emergency Department Survey were analyzed for the years 2005 to 2007. Sample weighted estimates were obtained for the total number of visits at which utilization of 1) AP, 2) ASH, or 3) ASH/AP combination occurred. Significant predictors of ASH/AP utilization vs. AP utilization alone were determined using multivariate logistic regression analysis.

**Results:** During the years 2005 to 2007, ASH was utilized at ~15.3 million (± 0.74) adult ED visits. There were an estimated 1.9 million (± 0.15) visits with AP utilization, and there were an estimated 1.5 million (± 0.15) visits with ASH/AP utilization. ASH accounted for ~81% (95% CI 78.8–82.2) of all utilizations, while AP accounted for ~19% (95% CI 18.2–20.2). Age greater than sixty years was a negative predictor (OR 0.42, 95% CI 0.32–0.55, p < 0.0001) of ASH/AP vs. AP utilization. Visit occurrence in a metropolitan statistical area (OR 2.3, 95% CI 1.6–3.3, p < 0.0001) and a psychiatric diagnosis the in presence or absence of alcohol abuse (OR 25.0, 95% CI 21.3–29.4) were positive predictors of ASH/AP vs. AP utilization. There was a negative interaction between a psychiatric diagnosis and an alcohol abuse diagnosis being made at ED visits which reduced the odds of ASH/AP vs. AP utilization (OR 15.63, 95% CI 11.9–20.4), although the overall effect remained positive.

**Conclusion:** Utilization of ASH and AP medications occurs frequently at U.S. adult ED visits. The epidemiology and characteristics of these visits deserve the attention of providers given the frequency with which these visits are made.

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**345 Reliability and Validity of the Agitation Severity Scale in Adult Acute Psychiatry Patients**

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**Background:** Agitation is a frequently observed phenomenon in mental health patients being treated in the emergency setting. The availability of a reliable and valid instrument to measure agitated behaviors is key to developing and evaluating treatment strategies aimed at preventing and decreasing agitation.

**Objectives:** The purpose of this study was to evaluate the psychometric properties of a newly developed instrument, the Agitation Severity Scale, when used with adult acute psychiatry patients in the emergency department (ED).

**Methods:** This prospective, observational study was approved by university and hospital IRBs. Two hundred and seventy adult ED patients with psychiatric chief complaints and DSM-IV-TR diagnosis were observed using the newly developed Agitation Severity Scale and a second, established instrument, the Overt Agitation Severity Scale (OASS). Internal consistency reliability, equivalence reliability, construct validity, and convergent validity were all assessed. Factor analytic methods were used to examine the internal structure of the data.

**Results:** A 17-item instrument with a standardized Cronbach’s alpha coefficient of 0.91 resulted, providing evidence of a high degree of internal consistency reliability. Principle components analysis revealed a four-component solution accounting for 69% of observed variance. Internal consistency reliability ranged from 0.71 to 0.91 for the scale components. Equivalence reliability was established through the evaluation of Agitation Severity Scores assigned by independent evaluators, r = 0.99, K = 0.98. Construct validity was established through comparison of mean scores for subjects in the highest and lowest scoring quartiles. A statistically significant difference in scores was noted when comparing these groups, t = −17.688, df = 155, p < 0.001. Convergent validity was evaluated by testing the association between Agitation Severity Scores and scores obtained using the OASS. Pearson’s correlation coefficient for the associations between the scores ranged from 0.91 to 0.93, indicating a strong, positive relationship between the scores.

**Conclusion:** The Agitation Severity Scale was found to be both reliable and valid when used to assess agitation in adult acute psychiatry patients in the ED. Additional research is warranted to further refine the scale.

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**346 Obese Patients Receive Delayed Emergency Department Care: Body Mass Index (BMI) Greater Than 40 Is Associated With Longer Disposition Times**

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**Background:** Health care spending is increasing in the United States. The increased resources used by obese patients may be a small aspect of this increased cost. There are no studies in the emergency medicine literature measuring the time of emergency...
Objectives: Our study seeks to measure the disposition times of morbidly obese (MO) patients (BMI >40). Do these patients place a burden on ED resources by taking longer to manage? We use time of disposition on non-admitted patients as the primary outcome variable to answer this query.

Methods: We used an IRB-approved retrospective sequential cohort data analysis of ED medical records from our county teaching hospital (January 2010). Our data set of 102 morbidly obese patients (World Health Organization [WHO] Class 3 [BMI >40]) was compared to 195 normal or mildly obese patients (WHO Class 0 or 1 [BMI <35]). Inclusion was limited to patients of Emergency Severity Index (ESI) level 2 and 3 who presented for triage. The primary outcome variable was total length of stay for patients discharged home from the ED (length of stay non-admit). Secondary outcome variables of admission rate, CT utilization, and ultrasound utilization were also measured.

Results: Morbidly obese patients take much longer to disposition than normal or mildly obese patients. (Difference: 101 minutes [95% CI 55.9–146], p < 0.0001). The mean length of stay for patients BMI <35 was 287 minutes in contrast to 388 minutes for patients BMI >40. CT utilization was significantly less likely in the BMI Class 3 group compared to the BMI Class 3 group (0.41 [97% CI 0.19–0.63] vs. 0.65 [97% CI 0.55–0.75], difference: 0.24, 95% CI 0.03–0.27, p = 0.01). No significant difference in admission rate, age, or ultrasound usage was demonstrated.

Conclusion: In our institution, morbidly obese patients take significantly longer times to disposition home than patients of more normal weight. This retrospective analysis should be considered hypothesis provoking and lead to prospective workflow analysis. We also generated data demonstrating significantly higher CT utilization in the morbidly obese group. The overall CT utilization rate was surprising.

347 Validation of High-risk ECG Features in Acute Drug Overdose
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Background: In a previous study we derived high-risk ECG features associated with adverse cardiovascular events (ACVEs) in emergency department (ED) patients with acute drug overdose. Objectives: We aimed to externally validate that ischemia, nonsinus rhythm, and ectopy are associated with ACVE in this population.

Methods: This prospective cohort study evaluated consecutive ED patients with acute drug overdose over 5 months at two urban teaching hospitals uninvolved in the original derivation cohort. Data included demographics, history, vital signs, and elements of the initial ECG (rhythm, intervals, ischemia, infarction), interpreted by a masked cardiologist. ECG evidence of ischemia and infarction were defined according to AHA criteria. In-hospital ACVE was determined by a masked cardiologist. ECG evidence of ischemia and infarction were defined according to AHA criteria. In-hospital ACVE was defined by composite outcome: shock (vasopressors), myocardial infarction were not significantly predictive.

Conclusion: This study validates the predictive utility of high-risk ECG features for ED patients with acute drug overdose. A screening ECG may be an important tool to evaluate in-hospital prognosis for acute drug overdose.

348 Hospital Use of Antidotes for Cyanide Toxicity Since FDA Approval of Hydroxocobalamin
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Background: Cyanide is a toxin released in structural fires and industrial accidents and is ingested in suicide. Hydroxocobalamin (HOCOB) was FDA-approved to treat cyanide toxicity in 2006. Sodium nitrite (SN) and sodium thiosulfate (ST) are other common antidotes. No report has described trends in US hospital use of HOCOB since approval.

Objectives: Our objective was to determine the frequency of antidote use as reported to U.S. Poison Centers from 2005–2009. In addition, we aimed to describe which antidotes were reported in critically ill cyanide toxic patients.

Methods: We performed a retrospective review over 5 years (2005–2009) from 61 US poison centers. We identified all cyanide exposed cases that received a cyanide antidote. Variables collected included demographics, gastric decontamination, antidote used, predefined serious effects who received HOCOB increased each year. In 2008 and 2009, HOCOB was reported more than SN or ST for each serious effect. In cases that received a serious therapy, HOCOB use increased from 21% to 47% over 3 years (p=0.02). HOCOB was used more in these cases than SN or ST in 2008 and 2009.

Conclusion: HOCOB use for cyanide toxicity increased each year in our study of cases that received cyanide antidotes as reported to U.S. Poison Centers. Reported use of ST and SN decreased over the same years. In addition, HOCOB was used more often each year in critically ill cyanide toxic patients than SN or ST.

349 Comparison of the Prevalence of Imported Lead-containing Dinnerware Purchased Inside Philadelphia’s Chinatown Versus Outside
Thomas Gilmore, Aaron Martin, Adam Bromberg, Andrea Gibbons, and Evan Rimmer
1Thomas Jefferson University Hospital, Philadelphia, PA; 2Thomas Jefferson Medical College, Philadelphia, PA

Background: Lead is a toxic element released in structural fires and industrial accidents and is ingested in suicide. Hydroxocobalamin (HOCOB) was FDA-approved to treat cyanide toxicity in 2006. Sodium nitrite (SN) and sodium thiosulfate (ST) are other common antidotes. No report has described trends in US hospital use of HOCOB since approval.

Objectives: Our objective was to determine the frequency of antidote use as reported to U.S. Poison Centers from 2005–2009. In addition, we aimed to describe which antidotes were reported in critically ill cyanide toxic patients.

Methods: We performed a retrospective review over 5 years (2005–2009) from 61 US poison centers. We identified all cyanide exposed cases that received a cyanide antidote. Variables collected included demographics, gastric decontamination, antidote used, predefined serious effects who received HOCOB increased each year. In 2008 and 2009, HOCOB was reported more than SN or ST for each serious effect. In cases that received a serious therapy, HOCOB use increased from 21% to 47% over 3 years (p=0.02). HOCOB was used more in these cases than SN or ST in 2008 and 2009.

Conclusion: HOCOB use for cyanide toxicity increased each year in our study of cases that received cyanide antidotes as reported to U.S. Poison Centers. Reported use of ST and SN decreased over the same years. In addition, HOCOB was used more often each year in critically ill cyanide toxic patients than SN or ST.
Background: Lead contamination of ceramic glaze and crockery has been reported from a variety of production sources, particularly those imported from outside the United States. Small privately owned stores have different distribution networks and may receive imported products via unmonitored sources.

Objectives: We hypothesized that imported eating and cooking utensils sold in small shops in an area of the city inhabited primarily by immigrants (Chinatown) will have a higher percentage of lead contamination than similar imported eating utensils sold outside the ethnic enclave.

Methods: Eight medical students divided Philadelphia’s Chinatown into four regions and identified four other geographically distinct areas of the city using Google Maps. Using departmental discretionary funds the students were instructed to purchase approximately five items made in and imported from China from each of 16 stores (86 items in total) within the geographic boundaries of Chinatown. Each item was less than $10. All items used for analysis were considered a form of dinnerware. The students then purchased 48 similar items made and imported from China from 16 stores in the areas outside Chinatown. Each item was gently washed with tap water and dried with a separate paper towel. LeadCheck® colorimetric swabs were used to test for lead according to the package instructions. Two medical student judges then independently determined positivity and inter-rater agreement was recorded. Each item was photographed with the LeadCheck® swab and chi-square analysis was used to compare the positive results from the items inside and outside Chinatown.

Results: Inter-rater agreement was excellent with kappa = 1. Twenty-one of the 86 items from Chinatown stores were lead-positive (prevalence 24.4%) compared with 4 of the 48 (prevalence 9%) of the items from stores outside Chinatown. Chi-square analysis found the prevalence to be significantly different (P=0.022). Owners of the stores with lead-contaminated inventory were notified, as well as representatives from the local health department, the CDC, and FDA.

Conclusion: Imported ceramic eating utensils and cookware are more prevalent in stores within Philadelphia’s Chinatown than in stores outside this ethnic enclave. This may represent an unrecognized source of lead exposure in a population that is not routinely screened for lead toxicity.

Patients With Rib Fractures Do Not Complicate Into Delayed Pneumonia: A Multi-centre Prospective Cohort Study of Minor Thoracic Injury

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Background: Patients admitted to the emergency department (ED) for minor thoracic injuries (MTIs) are possibly at risk for delayed pneumonia. Little is known about the characteristics of patients with MTIs revealed a very low incidence of delayed pneumonia. Nonetheless, our results support tailored follow-up for asthmatic or COPD patients with confirmed rib fractures as they are at increased risk for delayed pneumonia.

Results: A total of 502 patients were enrolled, of whom 134 (26.7%) were 65 years old or more. A total of 87 (17.3%) and 42 (8.4%) presented with one and two or more rib fractures, respectively. Delayed hemothorax (DHXs) occurred in 57 subjects (11.4%). Compared to patients with one or no fracture, those with two or more rib fractures suffered significant functional decline at one and three month follow-up (p<0.01); their ability to perform usual daily activities were lower at both one and three months (p < 0.01); their physical health score (PHS) and bodily pain (BP) were also worse (p < 0.05). Patients with DXHs had a much lower PHS mean score at one month (45.2 vs 45.2, p < 0.01) and three months (60.3 vs 73.1, p = 0.01). Their mean BP and their overall SF-12 physical functioning (FP) were also much worse (BP: 37.0 vs 54.3, p ≤ 0.01) at 1 month post-injury. Outcomes were not significantly different among patients aged 65 years or more when compared with their younger counterparts.

Conclusion: In this large prospective study, MTI created unsuspected disabilities up to three months after the injury. The presence of delayed hemothorax and of two or more rib fractures seemed associated with increased functional limitations. Overall BP and thoracic pain levels seemed to have an important effect at follow-up. Physicians should address rib fracture disability prevention and pain relief measures in their discharge instructions.

A Significant Functional Decline After Minor Thoracic Injuries

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Background: The presence of rib fracture is likely associated with functional decline after emergency department (ED) evaluation. Previous publications were done on small, hospitalized thoracic injuries.

Objectives: The present study aimed to evaluate the functional consequences, after minor thoracic injuries (MTIs), in relation to the number of rib fractures, the presence of delayed complications, and age.

Methods: Design and setting: A prospective cohort of patients 16 years and older with an MTI (with or without rib fracture), who presented at four university-affiliated EDs between March 1, 2008 and October 1, 2009, were assessed at four time points. Main functional outcome was assessed using the Medical Outcome Short-Form Health Survey (SF-12) at 30 and 90 days post-MTI. Thoracic pain level was assessed at initial ED visit, 14, 30, and 90 days post-injury. Univariate and correlation analyses were realized.

Results: A total of 502 patients were enrolled, of whom 134 (26.7%) were 65 years old or more. A total of 87 (17.3%) and 42 (8.4%) presented with one and two or more rib fractures, respectively. Delayed hemothorax (DHXs) occurred in 57 subjects (11.4%). Compared to patients with one or no fracture, those with two or more rib fractures suffered significant functional decline at one and three month follow-up (p<0.01); their ability to perform usual daily activities were lower at both one and three months (p < 0.01); their physical health score (PHS) and bodily pain (BP) were also worse (p < 0.05). Patients with DXHs had a much lower PHS mean score at one month (45.2 vs 45.2, p < 0.01) and three months (60.3 vs 73.1, p = 0.01). Their mean BP and their overall SF-12 physical functioning (FP) were also much worse (BP: 37.0 vs 54.3, p ≤ 0.01) at 1 month post-injury. Outcomes were not significantly different among patients aged 65 years or more when compared with their younger counterparts.

Conclusion: In this large prospective study, MTI created unsuspected disabilities up to three months after the injury. The presence of delayed hemothorax and of two or more rib fractures seemed associated with increased functional limitations. Overall BP and thoracic pain levels seemed to have an important effect at follow-up. Physicians should address rib fracture disability prevention and pain relief measures in their discharge instructions.
352 Differential Impact of Alcohol Abuse Patterns on Host Inflammatory Response Following Traumatic Injury
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Background: Epidemiological data indicate that more than 25% of traumatic injuries (TIs) treated in emergency departments are alcohol (EtOH) related. Long-term morbidity and mortality in this population is higher than in non-EtOH TI victims. The contribution of acute EtOH intoxication vs. history of EtOH abuse to outcome, particularly as it affects host immune responses to subsequent inflammatory challenges, is unclear.

Objectives: To differentiate the effect of acute vs. chronic EtOH abuse on integrity of host response to an inflammatory challenge during the early post-TI period.

Methods: Twenty-six patients over the age of 18 years meeting trauma activation criteria for whom informed consent was obtained were enrolled at a Level I urban teaching hospital. Alcohol Use Disorders Identification Test (AUDIT) scores and injury severity score (ISS) were calculated for each subject. Blood samples were obtained at time of admission and at post-admission days 1 and 5 for blood alcohol level (BAL) and cytokine determinations, and cytokine response to lipopolysaccharide (1 ug/ml for 4 hours) stimulation. Cytokine concentrations were determined by luminesay assay (Millipore). Correlations were calculated using Pearson’s correlation coefficient.

Results: 27% of patients were acutely intoxicated. Mean AUDIT score was 11 for BAL positive (BALP) subjects, 5.7 for BAL negative (BALN) subjects, and 7.9 overall (range 1–33). The difference between the means for AUDIT was not statistically significant (p = 0.168). Mean ISS was 7.4 for BALP subjects, 16.5 for BALN subjects, and 12 overall (range 1–24). The difference between the means for ISS was statistically significant (p = 0.006). Plasma cytokine concentrations, AUDIT, and ISS did not correlate with BAL. Stimulated cytokine response did not correlate with BAL or ISS, but showed significant positive correlation with AUDIT. (IL-1 r= 0.75, p=0.05; IL-6 r= 0.73, p=0.05; GM-CSF r= 0.80, p=0.011; TNF r= 0.72, p=0.069).

Conclusion: Self-reported history of chronic EtOH abuse has a greater effect on dysregulation of host response to inflammatory challenge than prevailing EtOH levels, reflecting acute EtOH abuse in TI victims. These findings suggest that chronic EtOH abuse plays a more important role than acute EtOH intoxication in dysregulation of host response and should be taken into account when stratifying risk for secondary infection in trauma patients.

353 Identifying High-Risk Lacerations in the Emergency Department
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Background: Traumatic lacerations are common, have infection rates around 2%, and are not routinely treated with prophylactic antibiotics. Previous work determined that treating wounds with a greater than 5% chance of infection is cost-effective.

Objectives: We sought to determine clinical predictors for a group of lacerations at high risk for infection.

Methods: Over an 18 month period, a prospective multi-center cohort study was conducted at a teaching hospital, trauma center, and community hospital. Emergency physicians completed a structured data form when evaluating and treating patients with lacerations. Patients were followed to determine whether they had suffered a wound infection requiring treatment with oral or IV antibiotics. Predictor variables were analyzed with univariate tech-
Background: Previous research has demonstrated the costs of injury care to be higher in trauma centers, yet it remains unknown whether out-of-hospital trauma triage also affects the cost of care.

Objectives: We examined the costs of acute trauma care based on field triage status within and between different types of hospitals.

Methods: This was a population-based, retrospective cohort study of injured children and adults evaluated by 43 emergency medical services (EMS) agencies transporting to 55 hospitals in the Portland, Seattle, and Denver metropolitan regions from 2006–2008. Patient-level hospital information and costs were probabilistically linked to EMS records. Variables included: triage status (triage criteria); hospital type; age; sex; GCS; sBP; out-of-hospital IV and intubation; mechanism; injury severity; surgical interventions; and transfusion. The primary outcome was cost of acute injury care (hospital/facility, interhospital transport, and emergency department care). Costs were calculated from charges using variable generalized linear models (gamma distribution) to calculate the adjusted average cost of care for patients by triage status and hospital type.

Results: 81,970 injured patients were transported by EMS to seven Level I trauma centers (n=63,778, 78%), three Level II centers (n=10,921, 6%), and 45 non-tertiary hospitals (n=107,271, 59%). 23,814 (13%) met trauma triage criteria. Average adjusted total costs of care for out-of-hospital triage (+) were: Level I $16,146, Level II $12,733, and non-tertiary $10,962. For triage (-) patients, these values were: Level I $12,158, Level II $9,063, and non-tertiary $9,946. For triage (-) patients, costs were: Level I $16,146, Level II $12,733, and non-tertiary $10,626. All values were significantly different (p<0.001) after accounting for case mix and important confounders. Meeting triage status was greater than 10 in 9% of patients. Twenty-eight percent of patients were admitted. There were no mortalities.

Conclusion: The adjusted costs of acute injury care are highest among patients meeting out-of-hospital triage criteria and cared for in Level I trauma centers. However, the costs of care are notably higher for triage (+) patients treated within similar level hospitals after controlling for injury severity and other confounders. These findings suggest that costs are modified by both out-of-hospital triage decisions and transport destination.

Background: In NYC, pediatric pedestrians struck by motor vehicles account for thousands of visits to pediatric emergency departments. In 2007, approximately 60 children were killed due to this mechanism of injury. Currently, NY State collects retrospective information of admitted pediatric pedestrians injured.

Objectives: Our goal is to collect comprehensive information prospectively of all children injured as a pedestrian or cyclist vs. motor vehicle. This novel project will allow better delineation of risk factors to target injury prevention.

356 Safer Streets NYC: Pilot Pediatric Data From a Novel, Comprehensive Database of Pedestrians/Cyclists Struck By Motor Vehicles Presenting to the Bellevue Hospital Emergency Department
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Methods: We have developed a prospective database of all pedestrians/cyclists injured or killed by motor vehicles from December 22, 2008 until present. A pediatric patient is defined as age < 18 years. Information regarding circumstances of incident, injury mechanism, and hospital care was obtained from patient, guardian, emergency responders (paramedics, police, fire officers), and other sources (witnesses and medical record).

Results: Of 1000 patients, 116 (12%) were pediatric patients. The mean age was 11 years, with 40% of patients in the 6–12 age range. There was a male predominance. Eighty-five percent were pedestrians. One quarter of the cyclists were wearing a helmet. Fifty-two percent did not have adult supervision at the time of the incident. Five percent of incidents occurred within two blocks of school. Forty-two percent of patients were struck mid-block, 20% were darting out into the street, and two patients were boarding a bus. Eleven percent of patients were using an electronic device at time of injury. One patient reported cocaine and one patient was ethanol intoxicated. Twenty percent of patients had loss of consciousness and 6% had a GCS < 15 upon arrival. The injury severity score was greater than 10 in 9% of patients. Twenty-eight percent of patients were admitted. There were no mortalities.

Conclusion: Pediatric pedestrians and cyclists struck by motor vehicles are a public health hazard. The majority of injuries are low acuity and result in few hospitalizations. Injury prevention strategies should focus on improving traffic safety knowledge and safety gear wearing in children.

357 The Nexus Criteria: Inter-rater Reliability Between Residents Versus Attending Physicians in the Emergency Department
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Methods: We have developed a prospective database of all pedestrians/cyclists injured or killed by motor vehicles from December 22, 2008 until present. A pediatric patient is defined as age < 18 years. Information regarding circumstances of incident, injury mechanism, and hospital care was obtained from patient, guardian, emergency responders (paramedics, police, fire officers), and other sources (witnesses and medical record).

Results: Of 1000 patients, 116 (12%) were pediatric patients. The mean age was 11 years, with 40% of patients in the 6–12 age range. There was a male predominance. Eighty-five percent were pedestrians. One quarter of the cyclists were wearing a helmet. Fifty-two percent did not have adult supervision at the time of the incident. Five percent of incidents occurred within two blocks of school. Forty-two percent of patients were struck mid-block, 20% were darting out into the street, and two patients were boarding a bus. Eleven percent of patients were using an electronic device at time of injury. One patient reported cocaine and one patient was ethanol intoxicated. Twenty percent of patients had loss of consciousness and 6% had a GCS < 15 upon arrival. The injury severity score was greater than 10 in 9% of patients. Twenty-eight percent of patients were admitted. There were no mortalities.

Conclusion: Pediatric pedestrians and cyclists struck by motor vehicles are a public health hazard. The majority of injuries are low acuity and result in few hospitalizations. Injury prevention strategies should focus on improving traffic safety knowledge and safety gear wearing in children.

Background: The National Emergency X-Radiography Utilization Study (NEXUS) developed a decision rule for when cervical spine radiographs are required in the setting of trauma. Radiographs are required with the presence of any of the five components of the rule: posterior midline cervical spine tenderness (PMT), intoxication (TOX), altered level of alertness (AMS), focal neurologic deficit (FND), or painful distracting injury (DIS).

Objectives: Inter-rater reliability between physicians of different training levels has not been previously studied. This study seeks to compare the reliability of PGY 1-4 emergency medicine (EM) trainees versus EM attending physicians.

Methods: A convenience sample of patients presenting to an urban, academic, Level II emergency department (ED) with complaints of cervical spine pain following trauma were enrolled. All subjects received two examinations by an EM attending physician and by a PGY 1-4 EM trainee in a blinded fashion. The decision to obtain radiographs, either CT scans or plain x-rays, was not
controlled. Radiographs were not available at the time of the examinations. Krappa values were calculated for each component of the NEXUS rule.

**Results:** Eighty subjects were enrolled in the study. Each subject was evaluated by an EM attending physician and by an EM trainee. Krappa values for each of the NEXUS components were: PMT 0.70, TOX 0.72, AMS 0.22, FND 0.21, and DIS 0.13. Sixty of the subjects received radiography (28 CTs, 41 plain films, 8 both). One fracture (Cl lamina) was detected in this data-set.

**Conclusion:** In this study comparing the inter-rater reliability of EM trainees vs. EM attending physicians, two of the five NEXUS criteria (PMT, TOX) demonstrated substantial agreement, two (AMS, FND) fair agreement, and one (DIS) poor agreement. Emergency medicine residents were able to successfully apply the NEXUS criteria; however, due to the subjectivity of the criteria, there was poor agreement for DIS when compared to EM attending physicians. The DIS criteria may be an area of too much subjectivity when EM residents apply the NEXUS rule. More study on this point is required to ensure adequate application of the DIS portion of the rule.

### 358 An Evaluation of the Safety of Crotalidae Polyvalent Immune Fab (CroFab) in Pediatric Crotaline Envenomation

**Background:** Antivenin has been the primary treatment for serious snake envenomation in the United States for several years. While the safety and efficacy of Crotalidae polyvalent immune fab (CroFab) are well documented in adults, there are limited studies in the pediatric population.

**Objectives:** The purpose of our study was to compare envenomation characteristics and CroFab utilization between adult and pediatric patients, and to evaluate its safety profile in children.

**Methods:** The National Trauma Registry of the American College of Surgeons was queried for a 9-year period (10/1/00–12/01/09) to identify all patients with snake envenomation requiring admission who received CroFab. Patients were divided into adult and pediatric patients and, to evaluate its safety profile in children.

**Results:** Sixty-three adults and 41 children who were envenomated received CroFab. The amount (vials) of CroFab given for initial control (5.1 ± 1.7 adult vs. 4.8 ± 2.5 pediatric, p=0.408) and total amount given (12.1 ± 5.3 adult vs. 11.6 ± 4.9 pediatric, p=0.644) were similar. The pediatric cohort exhibited more severe envenomation across multiple grading systems (snakebite severity score p=0.004, minimal-moderate-severe scale p=0.081, grade I-IV scale p=0.036). Although pediatric patients had a higher percentage of reactions to CroFab, this was insignificant (9.8% vs. 4.8%, p=0.430). No patient experienced an anaphylactic reaction to CroFab or died.

**Conclusion:** Our study represents one of the largest comparisons of the safety of CroFab in adult and pediatric populations. Despite being more severely envenomated, the pediatric population did not require more antivenom for control or in total. Based upon our data, CroFab is both safe and efficacious in the pediatric population.

### 359 Digital Imaging Analysis of Scar Aesthetics

**Objective:** Aesthetic outcome is an important endpoint of wound care. To compare wound aesthetic scoring systems and to see if digital imaging (DI) could accurately analyze aesthetics of closed lacerations for future research follow-up (F/U).

**Background:** This is a sub-analysis of a prospective, randomized, IRB-approved trial conducted in an academic ED. Patients age 18–100 were included if they had simple uncomplicated lacerations that required repair by sutures. Scar appearance was assessed at 3–4 months using a previously validated 0–100 mm visual analog score (VAS) and 6 point wound evaluation score (WES) done by two trained emergency physicians (MD1/MD2); by patient VAS (VASp); by VAS by two trained plastic surgeons (Plast1/Plast2) using DI from a SMP camera. Data were evaluated when both surgeons independently felt that the DI was able to be adequately scored. Pearson correlation coefficients were performed.

**Results:** 3-4 month VASMD and WESMD F/U was obtained in 66/175 (37.7%), 3-4 month VASPlast F/U was obtained in 70/175 (40.4%), and 3-4 month DI assessment was obtained in 66/175 (37.7%). DI was evaluated for VASPlast in 34/66 (51.5%). Mean age in years was 36.9 +/-13.0. Key wound characteristics included: location (11.6% face, 11.8% UE, 67.7% hand, 5.9% LE, and 2.9% foot), shape (70.6% linear), mechanism (85.3% sharp), and mean laceration size 2.4 +/-1.2cm. Mean VASMD1 and MD2 were 84.2 +/-12.4 mm and 87.8 +/-10.5 mm. Mean WESMD1 and MD2 were 5.5/+-1.0 and 5.4/+-1.0. Mean VASp was 86.6/+-16.6 mm. Mean VASPlast1 and Plast2 were 78.7/+-26.6 mm and 66.2/+-30.2 mm. Correlations were moderate for VASMD1 vs MD2 (r=0.63 n=34; p=0.001), WESMD1 vs MD2 (r=0.70 n=34; p=0.001), and VASPlast1 vs Plast2 (r=0.74 n=34; p=0.001). Correlations were moderate for VASMD vs VASPlast (r=0.56 n=34; p=0.001), VASp vs WESMD (r=0.60 n=34; p=0.001), and VASMD vs WESMD (r=0.64 n=34; p=0.001). Correlations were weak for VASp vs VASPlast (r=0.25 n=34; p=0.16), VASp vs VASMD (r=0.37 n=34; p=0.03), and WESMD vs VASPlast at r=0.13 n=34; p=0.45.

**Conclusion:** Correlations were moderate for VASMD vs VASPlast; however, correlations were weak for VASp vs VASPlast and WESMD vs VASPlast. This study suggests there are limitations with routine DI as a tool for evaluating scar aesthetics. Future studies should consider modalities such as 3-D and high dynamic range imaging that may provide potential for better assessment.

### 360 The Impact of DNR Status on Mortality and Aggressiveness of Care in Patients With Severe Sepsis

**Background:** Severe sepsis is a high mortality disease state, and early resuscitation, which may include central venous access and vasopressors (invasive therapies), has been shown to decrease mortality. Strictly defined, “do not attempt resuscitation” (DNAR) indicates the desire to forego resuscitation in cardiopulmonary arrest; however, DNAR status has been shown to affect physicians’ administration of other therapies. This has not been investigated in severe sepsis.

**Objectives:** To define the incidence of DNAR status in patients presenting to the emergency department (ED) with severe sepsis and evaluate the proportion receiving invasive therapies.
Methods: Cohort study of consecutive patients presenting to a single ED with severe sepsis in 2009. Charts abstracted for DNAR status within 24 hrs of ED arrival, demographics, vitals, sequential organ failure assessment (SOFA) score, and inpatient/60-day mortality. Primary outcomes: morbidity and compliance with invasive treatments. Chi-square test used to describe univariate association of DNAR status and outcome variables.

Results: In 211 severe sepsis patients, 15.7% (n=33) were DNAR. DNAR patients were older (mean 77.0 vs 57.9 yrs, p<0.001), and while not statistically significant, were more likely to have cancer (48.5% vs 38.6%), and higher SOFA scores (6.2 vs 5.4). DNAR inpatient mortality was 39.4% vs 20.4% in non-DNAR patients (19% difference, 95% CI 1.3-36.7%) and 60-day mortality was 63.6% vs 26.6%, respectively (37% difference, 95% CI 19.3-54.7%). In patients with persistent hypotension (n=163), a central line was placed in 84.6% of DNAR patients, vs 64.7% of non-DNAR patients (19.9% difference, 95% CI 3.9-35.9%), and vasopressors were administered in 80.8% of DNAR patients vs 63.2% of non-DNAR patients (17.5% difference, 95% CI 3.7-34.7%).

Conclusion: In this single sample, 15.7% of patients with severe sepsis had DNAR directives documented within 24 hours of ED arrival, and the majority of these patients (60.6%) survived to hospital discharge. DNAR patients were more likely to receive invasive treatment measures in the ED.

361 C-reactive Protein as a Predictor of Bacterial Infection Among Patients Presenting With an Influenza-like Illness During the Influenza Season

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Background: Individuals presenting with influenza-like illness (ILI) who have bacterial infection are at higher risk for morbidity and mortality. Prior research has reported that CRP was helpful to distinguish which ILI patients have bacterial infection. During acute respiratory infections, C-reactive protein (CRP) has been shown to be elevated in both viral and bacterial infections; however, there is limited information on differences between these groups.

Objectives: To compare CRP levels among patients with ILI diagnosed with a bacterial infection, influenza infection, or other viral infection. A secondary objective was to compare the sensitivity of CRP to white blood cell count (WBCC) in detecting bacterial infection in this population.

Methods: We enrolled a convenience sample of adults with ILI presenting to an urban academic emergency department (ED) during the 2008–2009 and 2009–2010 influenza seasons. All subjects had nasal aspirates for viral testing, serum CRP, WBCC, and chest x-ray performed. Bacterial infection was determined by positive blood or sputum culture (done at physician discretion), or radiographic evidence of pneumonia. Receiver operating characteristic (ROC) curve and student’s t-test were used to analyze results.

Results: Over the two influenza seasons there were 80 total patients enrolled (42 influenza, 25 other viral infection, and 13 bacterial). CRP values were 25.78 (95% CI 18.46, 33.11) for influenza, 16.35 (95% CI 9.02, 23.69) for viral, and 121.87 (95% CI 59.25, 212.99) for bacterial. There was a significant difference between the bacterial group and both the influenza and other viral infection groups (p=0.023). The ROC curve, with an area under the curve of 0.956, demonstrated a CRP value of >47 as predictor of bacterial infection yielding a sensitivity of 0.89 (95% CI 0.63, 0.98) and false positive fraction of 0.11 (specificity 0.89). In contrast, a WBC >12 only had sensitivity of 0.65 (95% CI 0.37, 0.87).

Conclusion: CRP is both a sensitive and specific marker for bacterial infection in patients presenting with ILI during the influenza season. Further studies are needed to see whether CRP is predictive of outcomes in ILI.

362 Prehospital Time and Mortality of Trauma Patients in a Statewide Registry

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Background: Prehospital time has long been considered an important factor in the management of injured patients. A recent analysis of severely injured patients in a statewide registry found no association betweenprehospital time and mortality. Evidence from other studies on the association is mixed.

Objectives: We sought to determine whether increased prehospital time is associated with increased mortality for injured patients transported by emergency medical services (EMS) in a statewide registry. We additionally sought to determine the relation between day of week, time of day, and prehospital care intervals. We hypothesized that increased prehospital times would be associated with increased mortality, but that transport times would not differ as a factor of time of day or day of week.

Methods: We performed a retrospective analysis of state trauma registry data. Included in this analysis were trauma patients transported by EMS directly to trauma centers in the state of Pennsylvania from 2003–2007. We assessed the relation between prehospital time and mortality using logistic regression and adjusted for injury severity (using the TRISS method), comorbidities, sex, and insurance status. Subgroups examined included severely injured patients, blunt trauma patients, and penetrating trauma patients. Time of day and day of week were analyzed using Wilcoxon rank sum tests.

Results: Of 84,771 patients included in the analysis, 37.7% were female, 62.3% male, and the average age was 47.5. Overall, 91.7% sustained blunt trauma and 8.4% sustained penetrating trauma. Average injury severity score (ISS) was 13.7. and 6.9% of patients died. Prehospital time was not associated with mortality (OR for every minute of prehospital time 0.999; 95% CI 0.997 - 1.00; p =0.100). When prehospital times were assessed as 10 min increments, no increase in mortality was found (OR 0.999; 95% CI 0.997 - 1.00; p =0.110). Prehospital times were found to be shorter at night (59.5 min +/- 86.9 vs. day 68.0 +/- 112.7; p <0.001) and similar on weekends and on weekdays (weekend 66.2 min +/- 107.7 vs. weekday 66.0 +/- 107.5; p=0.5204).

Conclusion: In adjusted analysis, increasing prehospital time was not associated with increased mortality. Given that current thought regarding the optimal care of injured patients emphasizes rapid transport to definitive care, this result has important implications for the future organization and delivery of prehospital trauma care.

363 Derangements of Mean Arterial Blood Pressure, Pulse Oximetry, and Hematocrit as Predictors of 28 Day Mortality in Adult Emergency Department Patients With Suspected Infection

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Background: Optimization of arterial blood pressure, oxygen saturation, and hematocrit have been used as resuscitation goals in adult patients with severe sepsis.

Objectives: To establish that adult emergency department (ED) patients with a suspected infection can be risk-stratified for 28-day mortality by the presence of abnormal mean arterial pressure (MAP <65 mmHg), oxygen saturation (SpO2 <95%), and hematocrit (Hct <30%) on ED presentation.

Exclusion Criteria: For patients with repeat ED visits during the study period, only the index visit was used. Primary Outcome: 28-day all-cause mortality Data Analysis: Established abnormal cut-points were used to create dichotomous variables and univariate comparison was performed using chi-square test. Logistic regression was performed to determine the odds ratios for 28-day mortality for the variables of interest adjusted for age and sex.

Results: Two thousand eight hundred twenty-three patients were enrolled with a median age of 77 yrs (IQR 62–86), median MAP 69 mmHg (IQR 58–81), median SpO2 < 97% (IQR 95–99%), and median Hct 35.5% (IQR 31.1–39.5%). Overall 1094 patients (38.75%) had MAP < 65 mmHg, 642 (22.74%) had SpO2 < 95%, and 524 (18.7%) had a serum Hct < 30%. Twenty-eight day mortality was higher for patients with an MAP <65 mmHg [21% [95% CI 18–24%] vs. 12% [10–13%], p=0.001], SpO2 < 95% [19.6% [95% CI 15–23%] vs. 14.4% [13–16%], p=0.009], and Hct < 30% [25% [95% CI 20–30%] vs.13.5% [12–15%], p=0.001]. In a multivariate model adjusted for patient demographics, MAP < 65 mm Hg (OR 1.97 [95% CI 1.5–2.5], p<0.001), SpO2<95% (OR 1.4 [1.1–1.8], p=0.02), and Hct<30% (OR 1.9 [1.4–2.6], p<0.001) were associated with an increased risk of 28-day mortality.

Conclusion: We found that MAP<65mmHg, SpO2 <95%, and Hct<30% were associated with an increased risk of 28 day mortality in this cohort of adult patients with a provider-suspected infection.

364 Is There a Relationship Between Serum Troponin Concentration and Mortality in Acute Exacerbations of Chronic Obstructive Pulmonary Disease?
Anne-Maree Kelly and Sharon Klim
Western Health, St Albans, Australia

Background: Serum troponin concentration has been found to be of prognostic significance in a range of acute and chronic conditions. Data regarding the relationship between serum troponin concentration and outcome for acute exacerbations of chronic obstructive pulmonary disease (COPD) are sparse and conflicting.

Objectives: The aim of this study was to determine whether elevated serum troponin 1 concentration (TnI) at emergency department (ED) presentation is predictive of in-hospital mortality. We hypothesised that TnI elevation above the 99th centile would be poorly associated with increased in-hospital mortality (c-statistic <0.6).

Methods: This was a prospective cohort study of patients treated in the ED for acute exacerbations of COPD and admitted for ongoing care. Patients with a hospital discharge diagnosis listing COPD as a principal diagnosis were eligible for inclusion. Patients with missing biomarker data were excluded. Data collected included demographics, vital signs, severity classification by treating nurse, x-ray, ECG, blood gas and biomarker results, and in-hospital outcome. The outcome of interest was the relationship between TnI and in-hospital mortality. Data analysis was by odds ratio, logistic regression, and ROC curve analyses. Based on previous research, we estimated that to detect a 10% difference in mortality, a sample of at least 141 patients would be required.

Results: 252 patients were studied; 61% male, median age 73 (IQR 65–80). Seventy-nine patients (31.3%) had TnI levels >99th centile. There were 11 deaths (4.4%, 95% CI 2.3–7.9%). On univariate analysis, variables associated with increased mortality were pH <7.2 (OR 17.9, 95% CI 3.1–101.8), respiratory rate (OR 1.09, 95% CI 1.02–1.16), TnI >99th centile (OR 11.2, 95% CI 2.4–53.2), and treatment in the ED with non-invasive ventilation (NIV) (OR 5.3, 95% CI 1.5–18.7). On multivariate analysis TnI (OR 6.15, 95% CI 1.16–32.7), NIV (OR 5.21, 95% CI 1.03–26.38), and pH <0.01 (95% CI <0.01–0.07) were independently associated with mortality. AUC for TnI as a predictor of mortality was 0.77 (95% CI 0.65–0.90).

Conclusion: TnI is associated with increased mortality in patients presenting to the ED with acute exacerbation of COPD.

365 The Rapid Emergency Medicine Score (REMS): A Superior Predictor of Mortality in Trauma Patients
Chad M. Cannon1, Nia Thompson2, Niaman Nazir3, and Michael Moncure2
1University of Kansas Hospital, Kansas City, KS; 2University of Kansas Medical Center, Kansas City, KS

Objective: To evaluate the predictive ability of the Rapid Emergency Medicine Score (REMS), an attenuated version of the APACHE II score, as a risk stratification tool to predict in-hospital mortality in traumatically injured patients. Secondary objectives include comparing the REMS score to the Revised Trauma Score (RTS), Injury Severity Score (ISS), and Shock Index (SI) to determine which scoring scale is most accurate in predicting mortality.

Methods: A retrospective chart review of the trauma registry of an urban Level I trauma center was performed, and 3,572 patients admitted over a four year period were analyzed. The REMS score was calculated from the data available on arrival to the emergency department (ED) (age, blood pressure, heart rate, Glasgow Coma Scale score, respiratory rate, and peripheral oxygen saturation) and compared to mortality. The discriminatory power of REMS, RTS, ISS, and SI were compared using the area under the receiver operator characteristic curve (AUC).

Results: Increasing REMS was associated with increasing mortality, p < 0.001 (Table 1). An increase of 1 point in the 26-point REMS scale was associated with an odds ratio of 1.61 for in-hospital death (95% CI 1.53 to 1.60). REMS (AUC 0.94 ± 0.02) was found to be superior to RTS (AUC 0.90 ± 0.04), ISS (AUC 0.84 ± 0.01), and SI (AUC 0.59 ± 0.34) in predicting in-hospital mortality.

Conclusions: REMS is a simple, yet more accurate predictor of in-hospital mortality than traditionally used trauma scoring systems and may be a valuable addition to other ED triage criteria used to activate trauma team responses.

Table 1: REMS, RTS, ISS, and SI mortality at 28 days

<table>
<thead>
<tr>
<th>REMS</th>
<th>Alive, n</th>
<th>Dead, n</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>1734</td>
<td>3</td>
<td>0.17</td>
</tr>
<tr>
<td>3–5</td>
<td>979</td>
<td>16</td>
<td>1.61</td>
</tr>
<tr>
<td>6–9</td>
<td>554</td>
<td>34</td>
<td>5.78</td>
</tr>
<tr>
<td>10–11</td>
<td>81</td>
<td>22</td>
<td>21.36</td>
</tr>
<tr>
<td>12–13</td>
<td>35</td>
<td>18</td>
<td>33.96</td>
</tr>
<tr>
<td>14–15</td>
<td>14</td>
<td>13</td>
<td>48.15</td>
</tr>
<tr>
<td>16–19</td>
<td>10</td>
<td>20</td>
<td>83.33</td>
</tr>
<tr>
<td>20–21</td>
<td>0</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td>22–26</td>
<td>0</td>
<td>12</td>
<td>100</td>
</tr>
</tbody>
</table>

366 Mortality Benefit as Compliance to CMS Quality Core Measures Improves
Benjamin D Wiederhold, R. Carter Clements, and Jeanette Cotanche
Alameda County Medical Center, Oakland, CA

Background: Centers for Medicare and Medicaid Services (CMS) core measures have been developed to establish and benchmark quality of care standards for specific diseases. Compliance is publicly reported, used to rate hospitals and individual health care providers, and drive reimbursement. There is a paucity of published literature supporting clinical outcomes based on core measure performance. We report a physician-driven process improvement project for the pneumonia (PN) and acute myocardial infarction (AMI) measures with an observed mortality benefit that corresponds to measure compliance.

Objectives: To improve core measure compliance and observe clinical indicators as performance improves.

Methods: Core measure(s) performance was collected and aggregated by a third party vendor. The percentage of “perfect-performance” (patient encounters that satisfied 100% of each measure’s bundle) for each measure was recorded. To measure clinical
Objectives: To determine if lactate and a single episode of hypotension (sBP < 90) with in-hospital mortality. Data were collected on age, physicians’ suspicion of infectious etiology, both lactate (OR 4.18; 95% CI 2.24, 7.80) and a single episode of hypotension (OR 3.81; 95% CI 1.98, 7.34) had strong independent associations with in-hospital mortality. Age was also found to be independently associated with in-hospital mortality (OR 1.24; 95% CI 1.05, 1.47 for each 10 year increase in age). Suspected infectious etiology was not independently associated with mortality (OR 1.12; 95% CI 0.61, 2.07).

Conclusion: Among ED patients with SIRS, both lactate and a single episode of hypotension, independent of age or infectious etiology, were strongly associated with in-hospital mortality.

368 Association Between Weekend Hospital Presentation and Sepsis Mortality
Emilie S Powell, Rahul K Khare, D. Mark Courtney, and Joseph Feinglass
Northwestern University, Chicago, IL

Background: Mortality differences in weekend and weekday admissions have been observed in a variety of conditions that require aggressive early intervention, including myocardial infarction and stroke. It is unknown if there is a difference in early inpatient sepsis mortality in patients presenting to the emergency department (ED) on the weekend vs. weekdays.

Objectives: Our objective was to determine if there was a difference in early inpatient mortality (death on or before second hospital day) in patients with sepsis when presenting to the ED on the weekend when compared to weekdays.

Methods: Cross-sectional analysis of 114,601 ED admissions with a principal diagnosis of sepsis, severe sepsis, or septic shock (sepsis) from 575 hospitals in the 2008 Nationwide Inpatient Sample. Weekend admission was defined as ED presentation starting at 12am on Saturday until 11:59 pm on Sunday. Univariate association of sepsis admission time of weekend vs. weekday with early inpatient mortality was evaluated by chi-square test. A random effects logistic regression model of early inpatient mortality was done. We adjusted for co-morbidities using standard methodologies, and according to previous methods, we also adjusted for the hospital annual ED sepsis case-volume, age, sex, payer-status (Medicare, Medicaid, private insurance or self-pay), and weekend admission.

Results: Overall early inpatient sepsis mortality was 7.1%. The unadjusted early inpatient mortality rates for patients admitted on the weekend and weekday were 7.5% and 6.9% (p<0.001), respectively. The risk-adjusted odds ratio of early inpatient mortality of weekend vs. weekday admissions was 1.05 (95% CI 1.03-1.14, p=0.002).

Conclusion: After adjustment for patient characteristics including significant co-morbid conditions, there was a significant relationship between septic patients admitted on the weekend vs. weekdays and early inpatient mortality. Patients admitted on the weekend had a 5% increased odds of early inpatient mortality compared to patients admitted on the weekdays.

369 Cumulative Organ System Dysfunction to Predict Morbidity and Mortality After Out-of-hospital Cardiac Arrest
Michael N Cocchi, Brandon Giberson, Justin Saliciocci, Christopher Guszczak, Caitlin Jones-Bamman, and Michael W. Donnino
Beth Israel Deaconess Medical Center, Boston, MA

Background: Organ system dysfunction is used to stratify patients in diseases such as sepsis or trauma; little is known about the ability of organ dysfunction to predict outcomes after successful resuscitation from cardiac arrest.

Objectives: We hypothesized that organ dysfunction within the first 24 hours post-arrest would be associated with worse neurologic and hospital outcomes.OBJECTIVES: In 51% of patients, lactate was missing; the other variables were missing in < 1% of patients. Median age was 53 years (IQR 40–64); median lactate was 1.8 mmol/L (IQR 1.2, 3.1); 648 (67%) patients had suspected infectious etiology; and 85 (9%) patients had hypotension. After adjusting for age and suspected infectious etiology, both lactate (OR 4.18; 95% CI 2.24, 7.80) and a single episode of hypotension (OR 3.81; 95% CI 1.98, 7.34) had strong independent associations with in-hospital mortality. Age was also found to be independently associated with in-hospital mortality (OR 1.24; 95% CI 1.05, 1.47 for each 10 year increase in age). Suspected infectious etiology was not independently associated with mortality (OR 1.12; 95% CI 0.61, 2.07).

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A Significant Incidence of Delayed Hemothorax Following Minor Thoracic Injuries

Marcel Émond1, Natalie LeSage1, Jean-Marc Chauny2, Chantal Guimont3, Miville Plourde1, Eric Bergeron4, and Laurent Vanier5
1Unité de recherche traumatologie-urgente et soins intensifs, Quebec, QC, Canada; 2Hôpital du Sacré-Coeur, Montréal, QC, Canada; 3CHUQ-CHUL, Quebec, QC, Canada; 4Hôpital Charles-Lemoyne, Montréal, QC, Canada

Background: Patients admitted to the emergency department (ED) for minor thoracic injuries (MTIs) are possibly at risk of delayed hemothorax (DHx). Little is known about the epidemiology and characteristics of patients with MTIs treated on an out-patient basis who have DHx.

Objectives: We aimed to evaluate the incidence of DHx post-ED and the risk factors associated.

Methods: Design: A multi-centre prospective cohort study was conducted in four Canadian EDs, from March 2008 to August 2010. All consecutive patients, 16 years and older, with MTIs and discharged from the ED were screened and eligible. All initial chest x-rays were reported normal. A standardized clinical and radiological evaluation was performed upon initial ED visit and repeated at 1 and 2 weeks. Phone interviews were done at 30 and 90 days. Outcome: the presence of delayed radiological diagnosis of hemothorax. Data Analyses: Univariate and multivariate analyses were realized to obtain outcome measures.

Results: Of the 989 recruited participants, 254 (25.7%) were 65 years of age or more, 610 (61.6%) were male, and 304 (30.9%) had at least one rib fracture confirmed on radiological report. A simple level-ground fall was the most frequent mechanism of injury (n=325, 32.8%). Overall, 118 (11.9%) had developed a DHx within the first 14 days of follow-up. Our multivariate model, after controlling for patient age and co-morbidities, found pre-radiologically confirmed rib fracture, motor vehicle accident, and use of ASA to significantly increase the risk of DHx. OR were 4.4 (95% CI 2.6 - 7.1), 1.9 (1.1- 3.2), and 1.6 (95% CI 0.9 - 2.9), respectively.

Conclusion: This first large prospective cohort study on non-hospitalized patients with MTIs revealed a very high incidence of DHx. Our results support the development of clinical decision rules to orient tailored follow-up for MTI patients in the ED.

Number of Dysfunctional Organ Systems and In-hospital Mortality

<table>
<thead>
<tr>
<th># Dysfunctional organ system</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>3/22 (13.6)</td>
</tr>
<tr>
<td>2-3</td>
<td>32/53 (60.4)</td>
</tr>
<tr>
<td>4-5</td>
<td>14/18 (77.8)</td>
</tr>
</tbody>
</table>

371 Prediction of Post-injury Multiple Organ Failure: Derivation and Internal Validation of the Denver Trauma Organ Failure Score

Jody A. Vogel, Michael Liao, Emily Hopkins, Nicole Seleno, Richard L. Byyny, Craig Gravitz, and Jason S. Haukoos
Denver Health Medical Center, Denver, CO

Background: Trauma is a leading cause of morbidity and mortality. Multiple organ failure (MOF) is common among the most seriously injured patients. The ability to easily and accurately identify trauma patients in the emergency department (ED) at risk for MOF would be valuable.

Objectives: To derive and internally validate an instrument to predict the development of MOF in adult trauma patients from data available in the ED.

Methods: We used data from the Denver Health Trauma Registry, a prospectively collected and maintained database from an urban Level I trauma center and regional referral hospital. Consecutive adult patients from 2005–2008 were included. Multivariable logistic regression was used to develop a risk score from 40 candidate predictor variables, including demographics, injury characteristics, results of ED diagnostic evaluation, and therapeutic interventions. The outcome was development of MOF within seven days of admission as defined by the Sequential Organ Failure Score (SOFA) and died. Total organ dysfunction was associated with overall mortality in univariate analysis (P=0.001); this remained statistically significant after adjusting for downtime and initial rhythm (P=0.03, AUC=0.78). Total organ system dysfunction was associated with CPC score in univariate analysis as well as in a multivariable regression model with downtime and initial rhythm (P=0.006).

Conclusion: We derived a simple and internally valid instrument to predict MOF in adults following trauma. Use of this score may allow early identification of patients at risk for MOF and result in more aggressive targeted resuscitation and resource allocation.

Predictor Regression Coefficient Regression Coefficient Score

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Probability</th>
<th>Beta</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 65 years</td>
<td>0.20</td>
<td>1.25</td>
<td>0.73-1.77</td>
</tr>
<tr>
<td>Emergent intubation</td>
<td></td>
<td>3.11</td>
<td>2.72-3.49</td>
</tr>
<tr>
<td>Hematocrit &lt; 20%</td>
<td></td>
<td>2.26</td>
<td>1.60-2.91</td>
</tr>
<tr>
<td>Hematocrit ≥ 20%</td>
<td></td>
<td>1.29</td>
<td>0.93-1.64</td>
</tr>
<tr>
<td>Hematocrit &lt; 35%</td>
<td></td>
<td>0.50</td>
<td>0.06-0.96</td>
</tr>
<tr>
<td>ED systolic blood pressure &lt; 90 mmHg</td>
<td>Reference</td>
<td>1.19</td>
<td>0.44-1.94</td>
</tr>
<tr>
<td>Blood urea nitrogen ≥ 30 mg/dL</td>
<td>Reference</td>
<td>0.74</td>
<td>0.24-1.23</td>
</tr>
</tbody>
</table>

White blood cell count ≥ 20,000 μL | 0.74 | 0.24-1.23 | 1 |
of pseudo-PEA arrest. The appropriate timing of chest compressions during CPR may provide a survival benefit in pseudo-PEA arrest.

### 372 Synchronization of Chest Compressions With Residual Systolic Cardiac Activity During CPR Is Associated With Improved Cerebral Perfusion Pressures in a Swine Model of Pseudo-Pulseless Electrical Activity Cardiac Arrest

Todd M Larabee, Jenny Campbell, Alan Kopelove, Jon VonOhlsen, and Charles M Little

1University of Colorado Denver SOM, Aurora, CO; 2Quest Product Development Corporation, Arvada, CO

**Background:** Synchronization of chest compressions with residual systolic cardiac activity has previously been shown to improve coronary perfusion pressure in a swine model of pseudo-pulseless electrical activity (PEA) cardiac arrest.

**Objectives:** To determine if synchronization of chest compressions with residual systolic cardiac activity is associated with improved cerebral perfusion pressure in a swine model of pseudo-PEA cardiac arrest.

**Methods:** A partial-asphyxial swine model of pseudo-PEA arrest was used. Seven pigs were instrumented with central aortic (Ao), right atrial (RA), and cerebral sagittal sinus (SSP) pressure-transducing catheters while under general anesthesia. The animals were switched to IV anesthesia and ventilated with a hypoxic gas mix. Continuous EKG, Ao, RA, and SSP pressures readings were digitized and recorded to disk. Cerebral perfusion pressures (CePP) were calculated (CePP=MAP-SSP). Pseudo-PEA was defined as a systolic blood pressure <60 mmHg with persistent EKG and Aortic waveform. Differences between mean CePP values during specific phases of the cardiac cycle based on the presence of residual systolic cardiac activity were compared using Student’s t-test.

**Results:** Mean CePP was statistically different between compressions delivered during different phases of the cardiac cycle while in pseudo-PEA arrest. Mean CePP was significantly higher for systolic compressions compared to diastolic compressions (13.4±7.9 vs. 10.1±5.5 mmHg; p<0.001).

**Conclusion:** Synchronization of chest compressions with residual systolic cardiac activity is associated with higher CePP values than compressions performed during diastole in this animal model of pseudo-PEA arrest. The appropriate timing of chest compressions during CPR may provide a survival benefit in pseudo-PEA arrest.

### 373 Effects of Advertising and Venue Choice on Attendance at Public Compression Only CPR Instruction

Elaine Situ, Brian D. Vander Werf, Naomi Habib, Amber Rice, Nicole Smith, Karl Huebner, and Ashish R. Panchal

University of Arizona, Tucson, AZ

**Background:** The use of bystander CPR has demonstrated improved survival in patients with sudden, out of hospital cardiac arrest (OHCA). Due to the need to improve bystander CPR and the insufficient evidence on the best manner to teach the public this life-saving skill, we examined the role of advertising and venue choice on attendance at public CPR instruction.

**Objectives:** To determine what type of venue is most cost-effective in public education of compression only CPR (COCPR).

**Methods:** Analysis of the attendance of participants in the CPR Across America’s campaign in Tucson, AZ was done. Six sites were chosen including four hospitals, a shopping center, and a high exposure car show with an entrance fee. Advertising was done in four local newspapers and on three television news stations. Thirty-six posters and 100 flyers were distributed. At the event, foot traffic was directed to the event. Training of the lay public was done via a formalized 30 min presentation followed by hands-on instruction.

**Results:** Over 350 participants were taught COCPR across the six sites in Tucson, AZ. Total advertising costs were $3600 for newspaper and television, $350 for car show booking fee, and $422 for posters and flyers. Total numbers of participants, stratified by venue, are: four hospitals: 141 total (mean: 35 ± 24 per site); public sites (shopping mall 150 and car show 68) (mean: 104 ± 65 per site). General cost per participant was $19.15 for hospital venues, $4.47 for shopping center, and $15.00 for car show.

**Conclusion:** Our results suggest that the lay public were more apt to participate in COCPR classes when held in a public location. This made our advertising efforts for public venues more cost-effective. Teaching in a public venue appears to directly increase visibility, accessibility, and convenience, leading to an increase in the number of lay people willing and able to learn COCPR. Furthermore, this allows for a more cost-effective approach to teaching COCPR.

### 374 Effect of Real-time Automated and Delayed Summative Feedback on CPR Quality in Adult Out-of-hospital Cardiac Arrest: A Prospective Multicenter Controlled Clinical Trial

Subhash Chandra, Erik P Hess, Logan Kolb, Lucas Myers, and Roger D White

Mayo Clinic, Rochester, MN

**Background:** Previous studies have reported cardiopulmonary resuscitation (CPR) quality in cardiac arrest to be suboptimal.

**Objectives:** We hypothesized that the combination of real-time automated and delayed summative feedback would improve CPR quality in out-of-hospital cardiac arrest (OHCA).

**Methods:** We conducted a prospective controlled clinical trial in emergency medical services (EMS) treated adult OHCA patients with a presumed or documented cardiac etiology of arrest. CPR process measures, return of spontaneous circulation (ROSC), and neurologically intact (Cerebral Performance Category 1-2) survival to hospital discharge were compared before (phase I, September 2008 to September 2009) and after (phase II, October 2009 to June
Background: Endotracheal tube (ET) location must be confirmed and documented by means other than physical examination to ensure correct placement.

Objectives: Our purpose was to determine the rate of documentation of ET confirmation and whether outcomes of in-hospital cardiac arrest patients differ in relation to documentation rate.

Methods: Consecutive cardiac arrest data from 507 hospitals participating in the National Registry of Cardiopulmonary Resuscitation (NRCPR) were analyzed to determine appropriate documentation of ET confirmation, defined as capnography or an esophageal detector device (EDD). Using binary logistic regression analysis, patients whose ET placement was confirmed by capnography (n=43,735) or EDD (n=653) was compared to those without documentation (n=44,388). Results: Of the 431 patients enrolled, CPR quality data were obtained from the receiving hospitals. Survival data were retrieved from run reports and defibrillator data cards. Survival data were obtained from the receiving hospitals.

Results: Consecutive cardiac arrest data from 507 hospitals participating in the National Registry of Cardiopulmonary Resuscitation (NRCPR) were analyzed to determine appropriate documentation of ET confirmation, defined as capnography or an esophageal detector device (EDD). Using binary logistic regression analysis of ET confirmation, defined as capnography or an esophageal detector device (EDD). Using binary logistic regression analysis, patients whose ET placement was confirmed by capnography (n=43,735) or EDD (n=653) was compared to those without documentation. Binary logistic regression indicated that documentation of ET placement was associated with improved survival (13% vs 10%, p=0.003) between phase I and phase II, respectively.

Conclusion: Real-time automated and delayed summative feedback of EMS provider performance improved CPR quality. EMS systems should consider adopting defibrillator technology that provides real-time feedback and developing CPR quality assurance programs that provide summative feedback to care providers.

Background: The 2010 AHA Guidelines on Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) discuss supraglottic devices and intraosseous (IO) lines as alternatives to endotracheal intubation (ETI) and central line placement. During CPR, both ETI and central line placement may be difficult, delaying time to airway placement and vascular access. CPR quality may also be compromised as an increase in “hands off time” or “no flow time” may result from pauses in compressions to facilitate these procedures. Use of supraglottic airways and IO lines is easier and faster than standard techniques, while offering similar benefits of airway management and vascular access.

Objectives: To assess whether using interventions such as laryngeal mask airways (LMA) and IO lines leads to improved resuscitation in a simulated cardiac arrest when compared to standard methods of ETI and central line placement.

Methods: Emergency medicine residents at a single urban academic center were grouped into teams of four with one resident from each of the four PGY levels. Each team participated in two simulated ventricular fibrillation cardiac arrests using a high fidelity simulator. Peripheral IV access was unobtainable. Only ETI supplies and a central line kit were available in one case (control), and in the other case those supplies were replaced by an LMA and an EZ-IO drill kit (experimental). Groups were randomized to which set up they were given first. Data examined included time to airway placement, duration and success rate of airway placement, time to vascular access, time to defibrillation, and percent hands off time.

Results: Forty-four residents in 11 teams participated. Mean time to airway was lower in the experimental group (122.8 sec vs 265.6 sec, p=0.001). Mean duration of airway attempt was also lower (7.6 sec vs 22.7 sec, p=0.002). Mean number of airway attempts was lower in the experimental group and approached statistical significance (1.09 vs 1.55, p=0.053). Time to access was lower in the experimental group (49.0 sec vs 194.6 sec, p=0.001). Time to defibrillation and percent hands off time did not significantly differ between the two groups.

Conclusion: Use of an LMA and an IO device led to significantly faster establishment of an airway and vascular access in a simulated cardiac arrest. Use of an LMA also trended toward a higher success rate versus standard ETI. The variation in devices did not affect time to defibrillation or total hands off time.
**Background:** Studies have shown that simulation improves performance in situations similar to those practiced, though whether these skills are transferable to other settings is unclear.

**Objectives:** To determine whether, in a setting where an emergency is unexpected, learners trained using simulation will be more likely to recognize the need for critical interventions than those trained using traditional methods.

**Methods:** Two hundred and sixty-nine fourth year medical students evaluated a standardized patient portraying a case of ruptured abdominal aortic aneurysm, and completed a post-encounter note listing differential diagnoses and key management steps. This was done in the context of a Step 2-CS style exam that did not emphasize emergencies. The notes were scored, and requests for key interventions were compared between learners that did not emphasize emergencies. The notes were scored, and requests for key interventions were compared between learners who had not (n=69). Interventions assessed included adequate IV access, volume resuscitation, blood product administration, appropriate imaging, and surgical consultation. Recognition of the correct diagnosis and requests for harmful actions were all scored.

**Results:** The mean age of the 128 participants was 45 years; 49 (38%) were male and 79 (62%) were female. Eighty-five percent of the study group reported having access to a health care provider and 66% had, or were at risk for, heart disease. On a scale from 1 to 10 (not very important to very important), the participant’s mean response as to the importance of his or her personal knowledge of CPR was a 9 and the importance of his or her family knowing CPR was also a 9. At follow-up, 19 subjects (15%) were lost to follow-up. Twenty-nine subjects completed the kit (27%). Seventeen additional persons (multiplier effect) completed the CPR kit (subject’s family and friends). There were four subjects enrolled who did not complete the kit and had a family member do so; they were all men whose wives completed the kit.

**Conclusion:** The majority of ED patients report that knowing how to perform CPR (themselves and their families) is very important. However, the minority of these same patients and their families are motivated to complete a CPR Anytime™ kit, even when provided at no expense to them. The benefit of the few who learn CPR from this type of effort must be offset by the program cost.

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**Background:** Should Family Be Present During Resuscitation? The Patient and Family Perspective

**Objectives:** The objective of this study was to determine patient and family sentiments regarding presence at the bedside during medical resuscitations in the emergency department (ED). In addition, we sought to determine whether the patient and family members wanted the family to have input in the decision to terminate resuscitative efforts.

**Methods:** A survey was administered by trained research assistants to patients (>50 years old) treated in the critical care section of the ED. A similar survey was administered by the research assistants to the next-of-kin family member, if present, for each polled patient. Unstable patients and those who could not answer a verbal survey were excluded. The survey focused on history of medical resuscitation, desire of family presence during a potential future resuscitation, and whether the family member should be included in the decision to terminate resuscitative efforts.

**Results:** Fifty-seven surveys were completed from patients (n=32) and patient family members (n=25). Most patients (59%, 95%CI 42–74%) and family members (60%, 95%CI 41–77%) stated a desire for the presence of a family member during a medical resuscitation. When told that the resuscitation may appear unpleasant or bloody, the support to be present dropped in both patients (44%, 95%CI 28–61%) and families (56%, 95%CI 37–73%). Despite that, both patients (69%, 95%CI 51–82%) and families (68%, 95%CI 48–83%) showed support for family presence during the resuscitation even if it ended with the patient’s death. Both groups support a family member having a role in the decision to end the resuscitation (69%, 95%CI 51–82% for patients and 84%, 95%CI 65–94% for family).

**Conclusion:** Most patients want their family members present during a medical resuscitation, and most family members wish to be present. Furthermore, most patients and family members agree that they would like family members to be involved in the decision to terminate resuscitative efforts.

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**Background:** Continuous Chest Compression Protocol Improved Cardiac Arrest Survival Over Historical Cohort

**Objectives:** Continuous chest compression protocol improved cardiac arrest survival over historical cohort.

**Methods:** Two hundred and sixty-nine fourth year medical students evaluated a standardized patient portraying a case of ruptured abdominal aortic aneurysm, and completed a post-encounter note listing differential diagnoses and key management steps. This was done in the context of a Step 2-CS style exam that did not emphasize emergencies. The notes were scored, and requests for key interventions were compared between learners that did not emphasize emergencies. The notes were scored, and requests for key interventions were compared between learners who had not (n=69). Interventions assessed included adequate IV access, volume resuscitation, blood product administration, appropriate imaging, and surgical consultation. Recognition of the correct diagnosis and requests for harmful actions were all scored.

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**Background:** Continuous chest compression protocol improved cardiac arrest survival over historical cohort.
200 continuous chest compressions (CCCs) over 120 seconds with passive oxygenation using oral or nasal airway and non-rebreather oxygen mask. Intubation was delayed until after a minimum of three cycles (600 compressions) were performed and was not required.

Objectives: To determine the effect of a CCC protocol on prehospital cardiac arrest survival rates.

Methods: This was a retrospective observational cohort study in an urban advanced life support paramedic system with 65,000 calls and 45,000 transports per year. Inclusion criteria: adult primary cardiac arrests that were bystander-witnessed and in ventricular fibrillation or pulseless ventricular tachycardia (Utstein survival rate). Arrests witnessed by medical personnel were excluded. Primary outcome was survival to discharge. Data were collected from the Office of the EMS Medical Director's ongoing quality improvement database. The historical cohort was from January 1, 2003 to March 31, 2006; the modified 50:2 period was April 1, 2006 to March 31, 2007; and the CCC period was September 1, 2008 to August 31, 2009. Odds ratios were calculated for survival rates with a p-value of less than 0.05 set for significance, and 95% CI were calculated.

Results: The survival rate was significantly improved in the CCC cohort (18/49, 36.7%) as compared to the historical cohort (32/143, 22.4%; p=0.048) with an OR for survival of 2.91 (95% CI: 1.00-4.86). There was no significant improvement in the survival in the CCC cohort as compared to the modified 50:2 cohort (25/57, 43.9%, p=0.46; OR 0.74, 95% CI: 0.34 - 1.62).

Conclusion: The CCC protocol showed improved survival when compared to the historical cohort and did not differ significantly in the survival rate when compared to the modified 50:2 cohort.

### Throughput and Patient Satisfaction Metrics

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<th>Post-CPOE</th>
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<tr>
<td>Physician satisfaction (%)</td>
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### 382 Effects of a Comprehensive Faculty Remuneration Plan on Educational Productivity and Innovation

**Background:** At our institution, a comprehensive faculty remuneration plan (FRP) accounts for all sources of revenue and expense allocated to each faculty member in the school of medicine. This plan is directly linked to total physician compensation and is inclusive of all educational funds. Undergraduate medical education (UME) funds are distributed from the medical school to clinical departments based on departmental UME teaching efforts using a predictable formula.

**Objectives:** We hypothesized that a system which distributes UME funds in direct proportion to UME effort would increase total UME effort delivered by emergency medicine (EM) faculty members both individually and as a group and promote curricular innovation.

**Methods:** This project was conducted within an academic department of EM at a traditional U.S. allopathic medical school with well-developed UME and GME programs. A departmental FRP was enacted on 7/1/2008 which, using a predetermined rate schedule, awarded faculty members teaching relative value units (TRVUs) for teaching efforts related to medical students. Data on UME teaching performed by faculty were collected prospectively from 7/2008 through 6/2010. Individuals were excluded from analysis if they were not employed by our department for the entire two-year study period. Our endpoints were year-on-year changes in teaching productivity and level of faculty participation in UME stratified into high (>100 TRVU), medium (>15 and < 100 TRVU/yr), or low (<15 TRVU/yr) producer categories.

**Results:** Nineteen faculty members were included for analysis. Total faculty TRVU production increased by 32% (1021 in FY09 vs. 1346 in FY 2010). Of the 19 faculty, 15 (79%) had an increase in teaching effort, 3 (16%) had a decrease, and 1 (5%) had no change. There was an increase in the percentage of high and medium effort faculty (+10% and +16%, respectively) and a decrease in low effort faculty (−26%). Changes within each category were as follows: high - increased from 3 to 5 (+67%), medium - increased from 6 to 9 (+50%), low - decreased from 10 to 5 (−50%).
Objectives: We sought to determine whether precepting medical students affects resident productivity.

Methods: This study was performed at a tertiary care ED with a 70,000 annual patient census. We performed a computer-based (Verinet Systems) retrospective review of patient encounters initiated by PGY2 and PGY3 residents assigned to medical student precepting shifts and compared data from these shifts with those of the same residents not assigned to precepting shifts. Data collection over 12 months included shift length from the monthly schedule and number of patients and RVUs from the Verinet System. Pts/hr and RVUs/hr were calculated. Daily census data were also collected. Pts/hr and RVUs/hr were evaluated as a function of both level of training and medical student precepting. Parameters were compared using two-tailed t-tests. The study was approved by the IRB.

Results: Daily census was 202 with no difference between days with and without students (p=0.29). In comparing PGY3s and PGY2s while precepting medical students, PGY3s saw 1.40 pt/hr (CI 1.27–1.53) compared to 1.28 pt/hr by PGY2s (CI 1.22–1.34, p=0.07), and PGY3s generated 3.97 RVU/hr vs 3.82 RVU/hr for PGY2s (p=0.39). In comparing PGY3s working independently to those who were precepting, those working independently saw a similar number of patients (1.39 pt/hr, CI 1.27–1.53, p = 0.88) and generated a similar number of RVUs (4.03 RVU/hr, p = 0.68). In comparing PGY2s working independently to those who were precepting, those working independently saw a similar number of patients (1.28 pt/hr, CI 1.20–1.36, p= 0.94) and generated a similar number of RVUs (3.74 RVU/hr, p=0.44).

Conclusion: In this study, resident productivity was not affected by precepting medical students.

385 Comparison of Two Clinical Productivity Incentive Plans for Academic Emergency Physicians: Individual Versus Group-based Performance

Christopher E Ortiz1, Robert D Greenberg1, David L Morgan2, and C. Keith Stone1

1Scott and White Memorial Hospital, Temple, TX; 2Texas A&M Health Science Center, Temple, TX

Background: There is growing pressure to maximize clinical productivity for academic emergency physicians. Incentive plans based on relative value units (RVUs) have not been widely studied for emergency medicine (EM) faculty.

Objectives: Our goal was to determine the effects of two different RVU-based incentive plans introduced simultaneously to the EM faculty at a teaching hospital emergency department (ED).

Methods: Design: Retrospective analysis for 6 months prior and 6 months following the implementation of two incentive plans. Intervention: Both incentive plans were “base + incentive” models with a semi-annual incentive payment based on a target of 8.4 RVUs per hour. However, each physician selected whether to be in the non-pooled or the pooled distribution group. The non-pooled physicians received the entire bonus if they achieved the goal. The pooled physicians shared equally from those that achieved the goal. The amount of the pooled bonus was determined by the fraction of pooled physicians who met the goal individually. Setting: A Level I trauma center academic teaching ED with an EM residency program. Type of participants: 14 full-time EM faculty members with 1–25 years experience.

Results: Four faculty members self-selected to the non-pooled group and 10 members to the pooled group. The EM faculty treated 10.6% more patients and worked 2.9% more hours during the incentive plan period due to decreases in part-time faculty coverage. All but one of the 14 physicians showed a productivity increase: 0.4 to 1.0 RVU/hr (~5% to 12%). Each of the four non-pooled physicians achieved the incentive goal, and their average productivity increased from 3.74 RVU/hr to 9.34 RVU/hr (75%). The pooled participants increased from 8.10 to 8.65 RVUs/hr (6.5%). Two pooled physicians did not meet the incentive goal but did share the bonus. There was no statistical difference between the improvement of RVUs/hr for the pooled versus the improvement for the non-pooled physicians (0.15 RVU/hr, 95%CI: 0.44 to 0.74).

384 Resident Productivity as a Function of Medical Student Precepting in the Emergency Department

Travis Cobb, Donald Jeanmonod, and Rebecca Jeanmonod

St. Luke’s Hospital and Health Network, Bethlehem, PA

Background: Emergency departments (ED) are a setting where patient care and medical education occur simultaneously. No study has evaluated whether precepting medical students affects resident productivity as measured by patients per hour (pts/hr) and relative value units per hour (RVUs/hr). Understanding these variables may allow for ED staffing that maximizes productivity.

Objectives: To determine if there are productivity differences between residents and PAs, as defined by patient seen (pt/hr) and RVUs generated per hour (RVU/hr), in a high-acuity area of the ED.

Methods: This is a retrospective review of residents and PAs assigned to a high-acuity area of a single center 42,000 volume community ED from July 2009 through September of 2010. Only day shifts were compared (07:00–17:00 or 08:00–18:00) because PAs do not work evenings or nights in the high-acuity area. PA shifts in low-acuity areas were excluded. Hours worked were collected from the resident and PA monthly work schedules. Other data were collected through query of the Verinet coding system. Number of patients seen and RVUs generated were recorded, and pt/hr, RVU/hr, and RVU pt were calculated. Two-tailed t-test was used to compare resident and PA performance. A sample size of 21 shifts per group was calculated as necessary for a power of 0.8 to determine a 25% difference in productivity, alpha 0.05. The study was approved by the IRB.

Results: Fifty-five PA and 98 resident shifts were included (30 of these were shifts by PGY3 residents). During the study period, PAs saw 1.56 pt/hr (CI ± 0.14), while residents saw 1.23 pt/hr (CI ± 0.06, p<0.0001). PAs generated 3.19 RVU/hr (CI ± 0.29), while residents generated 3.33 RVU/hr (CI ± 0.17, p=0.43). Residents generated 2.73 RVU/pt (CI ± 0.09), while PAs generated 2.05 RVU/pt (CI ± 0.09, p<0.0001). In comparing the subgroup of PGY3s with PAs, PAs still saw significantly more patients (1.3 vs 1.56, p = 0.003), but PGY3s generated 3.58 RVU/hr compared to 3.19 RVU/hr for PAs (p=0.06). PGY3s generated 2.79 RVU/pt compared to 2.05 for PAs (p=0.0001).

Conclusion: In a high-acuity area of the ED, PAs see more pt/hr than residents, but generate fewer RVU/pt. This suggests that residents may document more thoroughly than PAs. Alternatively, PAs may elect to see less sick patients even when working in a high-acuity area.

383 Physician Assistant and Resident Productivity in a High Acuity Environment

Deno Gualtieri, Donald Jeanmonod, and Rebecca Jeanmonod

St. Luke’s Hospital and Health Network, Bethlehem, PA

Background: Physician assistants (PAs) are utilized in many emergency departments (EDs) to provide care in a low-acuity, high-volume area, and are able to see more patients and generate more relative value units (RVUs) than residents in this setting. It is unknown if PAs are as productive as residents in a high-acuity setting.

Objectives: In a high-acuity area of the ED, PAs see more pt/hr, RVU/hr, and RVU/pt were calculated. Two-tailed t-test was used to compare resident and PA performance. A sample size of 21 shifts per group was calculated as necessary for a power of 0.8 to determine a 25% difference in productivity, alpha 0.05. The study was approved by the IRB.

Methods: This study was performed at a tertiary care ED with a 70,000 annual patient census. We performed a computer-based (Verinet Systems) retrospective review of patient encounters initiated by PGY2 and PGY3 residents assigned to medical student precepting shifts and compared data from these shifts with those of the same residents not assigned to precepting shifts. Data collection over 12 months included shift length from the monthly schedule and number of patients and RVUs from the Verinet System. Pts/hr and RVUs/hr were calculated. Daily census data were also collected. Pts/hr and RVUs/hr were evaluated as a function of both level of training and medical student precepting. Parameters were compared using two-tailed t-tests. The study was approved by the IRB.

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Conclusion: In this study, resident productivity was not affected by precepting medical students.
Conclusion: Both the pooled and non-pooled physicians showed a similar increase in productivity (0.35 and 0.4 RVUs/hr). The productivity of the pooled physicians after the incentive plan was still less than the non-pooled physicians prior to the plan. Overall, most physicians increased their productivity regardless of incentive plan.

386 Emergency Physicians With Higher Relative Value Units Spend Similar Amounts of Time at the Patient Bedsides as Their Colleagues

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1Christiana Care Health Services, Newark, DE; 2St. Michael’s Medical Center, Newark, NJ

Background: Emergency physicians (EPs) are expected to deliver quality care while maintaining high levels of efficiency and productivity as measured by the relative value unit (RVU). It is unknown whether EPs with higher RVUs per hour practice differently than their colleagues.

Objectives: We sought to determine whether EPs with higher RVUs spend less time at the bedside than their colleagues.

Methods: This was a prospective, observational, cohort study. A 13-item task list was generated, pilot-tested, and placed onto a computerized tablet. A research nurse used this tablet to input computerized times from three separate 1-hour long sessions for each EP tested. Those task times were then downloaded onto a Microsoft Excel spreadsheet and analyzed with a one-way analysis of variance (ANOVA) statistic, grouped by top, middle, and bottom third of RVU performance. A p-value of ≤ 0.05 was considered significant.

Results: A total of 16 EPs were used for this study. Top, middle, and bottom thirds of RVU performance (n): (5) 7.89 (95% CI 7.47–8.31); (6) 6.85 (95% CI 6.71–6.99); (5) 6.16 (95% CI 5.87–6.45); p<0.0001. See Table 1 for breakdown of tasks per EP group.

Conclusion: Despite differences in RVU-based productivity data, EPs spend similar amounts of time involved in the daily tasks of taking care of patients. Furthermore, EPs with higher RVU numbers do not spend less time at the bedside than their colleagues, underscoring that direct physician-patient interaction is one practice parameter that is not compromised among these EPs.

387 Impact of SANE (Sexual Assault Nurse Examiner) on the Emergency Medicine Residency Experience

Margaret K Sande, Jennie Buchanan, Maria Moreira, Emily Hopkins, Brooke Bender, and Kerry Broderick
Denver Health Medical Center, Denver, CO

Background: The emergency department is often the first place a violent crime victim will present; however, many emergency physicians are not properly trained to care for sexual assault (SA) patients. Sexual assault nurse examiner (SANE) programs have improved the quality of care for victims of SA, but it is unclear how these programs affect emergency medicine resident training.

Objectives: To gather information on emergency medicine residency programs’ training and policies regarding the care of SA patients and determine the affect of SANE programs on emergency medicine resident training.


Results: Among 152 programs surveyed, 71 (47%, 95% CI 39% - 55%) residency directors responded. When asked about resident requirements for procedural competency of SA exams, 22 residency directors (31%, 95% CI 21% - 43%) reported that their residency does not require procedural competency, and 27 (38%, 95% CI 27% - 50%) reported that their residents are required to perform less than five SA exams to demonstrate competency. Program directors asked how their programs established resident requirements for SA exams. Eleven directors (15%, 95% CI 8% - 26%) cited SANE-based recommendations. In contrast, 37 (52%, 95% CI 40% - 64%) did not know how their SA exam requirement was established. Fifteen (27%, 95% CI 16% - 40%) feel SANE programs have improved resident education, 10 (18%, 95% CI 9% - 30%) believe SANE programs have hindered resident education, and 25 (45%, 95% CI 31% - 59%) feel SANE programs have had no effect on resident SANE education.

Conclusion: While SANE programs enhance patient care and accuracy of evidence collection, they may affect resident competency with the SA exam by decreasing exposure. More than half of respondents did not know how their SA guidelines were established and few were based upon literature-based recommendations. We must define clear procedural competence guidelines for residents performing these exams and continue to develop our relationship with SANE programs such that residents learn to serve as equal advocates for victims of violent acts.

Table 1. Tasks Performed by EPs in Percentages of Time Observed (95% CI)

<table>
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<th>Factor</th>
<th>Bottom 1/3</th>
<th>Middle 1/3</th>
<th>Top 1/3</th>
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<td>Bedside</td>
<td>34.2% (18.92–49.48)</td>
<td>33.3% (26.34–40.32)</td>
<td>31% (20.68–41.32)</td>
<td>0.920</td>
</tr>
<tr>
<td>Charting</td>
<td>12.6% (3.33–21.87)</td>
<td>10% (7.86–12.14)</td>
<td>8.8% (5.44–12.16)</td>
<td>0.644</td>
</tr>
<tr>
<td>Resident interaction</td>
<td>12.2% (1.21–23.19)</td>
<td>7.3% (4.07–10.59)</td>
<td>11.8% (4.00–19.60)</td>
<td>0.607</td>
</tr>
<tr>
<td>Walking</td>
<td>9.2% (7.40–11.00)</td>
<td>10% (9.12–10.88)</td>
<td>9.8% (7.62–11.98)</td>
<td>0.782</td>
</tr>
<tr>
<td>Information seeking</td>
<td>8% (4.23–11.77)</td>
<td>14.2% (8.33–19.41)</td>
<td>9% (4.89–13.11)</td>
<td>0.160</td>
</tr>
<tr>
<td>Nursing interaction</td>
<td>7.4% (3.07–12.93)</td>
<td>3.7% (2.01–5.07)</td>
<td>4.2% (2.89–5.00)</td>
<td>0.097</td>
</tr>
<tr>
<td>Writing orders</td>
<td>3.8% (1.37–6.23)</td>
<td>8.33% (5.44–11.22)</td>
<td>5.6% (2.93–8.27)</td>
<td>0.097</td>
</tr>
<tr>
<td>Consultant interaction</td>
<td>3% (0.10–5.90)</td>
<td>5.3% (3.10–7.50)</td>
<td>6.4% (1.50–11.30)</td>
<td>0.410</td>
</tr>
<tr>
<td>Pedometer</td>
<td>0.39 km (0.22–0.57)</td>
<td>0.32 km (0.19–0.46)</td>
<td>0.47 km (0.26–0.68)</td>
<td>0.116</td>
</tr>
</tbody>
</table>

388 A Comparison of Demographics in Sexual Assault Survivors Over an Eight-year Period

Sandra DeCicco, Jessica Gatt, Robert Spencer, Karen Tenner, Theresa Pastrana, and Mary Frances Ward
North Shore-LIJ Health System, Manhasset, NY

Background: Sexual assault continues to be a public health concern and it is essential to longitudinally evaluate the demographics of survivors.

Objectives: The aim of this study was to compare the demographics of sexual assault survivors (SASs) over two 4-year periods between 1/1/2002 and 12/31/2009. All SASs who presented to the emergency department (ED) were examined by sexual assault nurse examiners (SANEs).

Methods: This study compared two retrospective, consecutive chart reviews of SASs treated by SANEs in the emergency department (ED) of a suburban, university-affiliated teaching hospital between 1/1/2002 and 12/31/2009. Charts were obtained via the hospital's sexual assault victims in the ED (SAVED) registry. Data
from charts were reviewed by select investigators. The chi-square test was used to analyze categorical data, and the Mann-Whitney test was used for continuous data.

**Results:** A total of 743 consecutive charts were reviewed. 333 (44.8%) charts were from 2002–2005 (Group A), and 410 (55.2%) charts were from 2006–2009 (Group B). In general, survivors were significantly older in Group A (mean age: 27.7 ± 11.5 years) than those in Group B (mean age: 26.1 ± 10.1 years) (p < 0.025). Three hundred and twenty-six (97.9%) SASs in Group A were female, and 307 (97.1%) in Group B were female. In more recent years, a larger percentage of SASs presented to the ED alone (32.3% for Group B vs. 17.1% for Group A, p < 0.0001), and they were more likely to have been assaulted by a known assailant (77.7% vs. 66.5%, p < 0.0005). SASs in Group B presented to the ED post-assault more quickly than those in Group A (16.9 hours vs. 21.2 hours, p < 0.03). Moreover, SASs in Group B were significantly more likely to arrive to the ED via ambulance than those in Group A (63.4% vs. 38.7%, p < 0.0001). There was no statistically significant difference between the two groups for race, sex, the incidence of loss of consciousness, marital status, or the acceptance of HIV, STD, hepatitis, or pregnancy prophylaxis.

**Conclusion:** Results show that between 1/1/2002 and 12/31/2009 the number of SASs presenting to the ED increased and that the average age of SASs decreased. The average time for SASs to present to the ED following assault decreased over this period. Also, the percentage of assaults by known assailants has increased in more recent years. These data suggest there is a need for continued efforts to encourage SASs to seek prompt care upon assault.

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**Human Immunodeficiency Virus Post-exposure Prophylaxis Acceptance Among Sexual Assault Survivors in the Emergency Department**

Sandra DeCiccio, Jessica Gatt, Robert Spencer, Karen Tenner, Megan McCullough, Theresa Pastrana, Mary Frances Ward, and Andrew Sama

North Shore-LIJ Health System, Manhasset, NY

**Background:** Studies show that human immunodeficiency virus (HIV) post-exposure prophylaxis (PEP) is well-tolerated among sexual assault survivors (SASs) with few reported serious adverse reactions.

**Objectives:** The aim of this study was to assess the acceptance of HIV PEP for SASs examined by sexual assault nurse examiners (SANEs) in the emergency department (ED).

**Methods:** This was a retrospective, consecutive chart review of SASs treated by SANEs in the ED of a suburban, university-affiliated teaching hospital from 1/1/2006–12/31/2009. Charts were obtained through the hospital’s sexual assault victims in the ED (SAVED) registry. Data were entered into the SAVED database by a limited number of investigators. SASs were excluded if they were HIV-positive or if they were assaulted without penile-vaginal, penile-anal, or penile-oral contact (oral touching of assailant’s genitalia). The chi-square test was used to analyze categorical data, and the Mann-Whitney test was used for continuous data.

**Results:** In total, 398 consecutive charts were reviewed. Of those, 281 (70.6%) were eligible for inclusion (mean age 25.8 ± 9.0 years; 97.5% female). Of those excluded, one was HIV-positive, 52 (13%) were male. 138 (38%) of females were undergraduate students, and 52% of males were unemployed/non-students. 275 (60%) were 18–25 years of age. 18–25 years of age. 72 (14%) were seen by a Sexual Assault Nurse Examiner (SANE), and 216 (47%) by social work. Of the 230 (49%) prescribed PEP, 102 (44%) attended at least one ID visit, and 51 (22%) attended a day 28 PEP course. Factors associated with presentation <72 hours were student status (OR 2.28; 95% CI 1.15–4.54, P=0.02), mucosal trauma (OR 2.4; 95% CI 1.03–5.2, P=0.04), and no condom use (OR 2.5; CI 1.36–4.60, P=0.004). Presentation >72 hours was associated with multiple assailants (OR 1.43; 95% CI 1.01–2.03, P=0.05). Predictors of presenting to initial ID visit and of finishing a 28 day course of PEP were ED evaluation by social work (OR 1.81; 95% CI 1.06 – 3.11, P=0.003) and SANE (OR 2.2; 95% CI 0.87–5.76, P=0.096). Multiple assailant assault was negatively associated with ID visit presentation (OR 0.71; 95% CI 0.50 – 1.03, P=0.07) and finishing PEP (OR 0.6; 95% CI 0.32–0.99, P=0.045).

**Conclusion:** The majority of SA patients were students with known assailants, often involving substance use, highlighting a need for targeted education. Prescribing errors were common. Victims of multiple assailants are often lost to follow-up. Social work and SANE involvement increases adherence with PEP and follow-up care.

**A Tale of Two Trends: Utilization of Computed Tomography in American and Canadian Emergency Departments**

Carl T Ber Dahl1, Marian J Vermeulen2, David B Larson3, and Michael J Schull4

**Methods:** A retrospective review of all SA survivors seen in the ED from 1/1/02 to 12/31/07. Since implementation of a multidisciplinary PEP program, we identified prescribing errors, and predictors of early vs. late ED presentation, ID clinic follow-up, and completion of 28 days of PEP.

**Results:** 459 patients presented to the ED following SA; 407 (89%) were female and 52 (11%) were male. 138 (38%) of females were undergraduate students, and 52% of males were unemployed/non-students. 275 (60%) were 18–25 years of age. 230 (49%) prescribed PEP, 102 (44%) attended at least one ID visit, and 51 (22%) finished a 28 day PEP course. Factors associated with presentation <72 hours were student status (OR 2.28; 95% CI 1.15–4.54, P=0.02), mucosal trauma (OR 2.4; 95% CI 1.03–5.2, P=0.04), and no condom use (OR 2.5; CI 1.36–4.60, P=0.004). Presentation >72 hours was associated with multiple assailants (OR 1.43; 95% CI 1.01–2.03, P=0.05). Predictors of presenting to initial ID visit and of finishing a 28 day course of PEP were ED evaluation by social work (OR 1.81; 95% CI 1.06 – 3.11, P=0.003) and SANE (OR 2.2; 95% CI 0.87–5.76, P=0.096). Multiple assailant assault was negatively associated with ID visit presentation (OR 0.71; 95% CI 0.50 – 1.03, P=0.07) and finishing PEP (OR 0.6; 95% CI 0.32–0.99, P=0.045).

**Conclusion:** The majority of SA patients were students with known assailants, often involving substance use, highlighting a need for targeted education. Prescribing errors were common. Victims of multiple assailants are often lost to follow-up. Social work and SANE involvement increases adherence with PEP and follow-up care.
Objectives: To compare rates of ED CT utilization in the USA and Ontario, Canada’s largest province.

Methods: This was a retrospective observational population-based study using a systematic survey in the U.S. (NHAMCS) and administrative health databases in Ontario for the years 2003–2008. ED CT utilization rates were determined overall and by patient characteristics. Rates were compared for four pre-specified clinical indications where CT is a common first-line diagnostic imaging test: headache, abdominal pain, chest pain/shortness of breath, and ‘complex abdominal pain’ (age >=65yrs, high-acuity triage, indications where CT is a common first-line diagnostic imaging test: headache, abdominal pain, chest pain/shortness of breath, and ‘complex abdominal pain’ (age >=65yrs, high-acuity triage, and admitted to hospital).

Results: For all-comers to the ED, the CT rate was 11.4% (95% CI 10.8–12.0) in the United States vs 5.9% (95% CI 5.9–5.9) in Ontario. Rates were higher in the United States across all demographics and reasons for visit subgroups, and rates increased faster from 2003 to 2008 in the United States (OR 2.00, 95% CI 1.81–2.21) than Ontario (OR 1.69, 95% CI 1.68–1.70). Over the study period, then CT rate decreased significantly from 0.62% (95% CI 0.59–0.64) to 0.52% (95% CI 0.50–0.54) among Ontarian children age <5yrs; however, in the United States there was an increasing trend from 1.8% (95% CI 1.3–2.2) to 3.2% (95% CI 2.1–4.2). Differences between regions were less marked for headache, abdominal pain, and chest pain/shortness of breath; no difference was seen in CT utilization in complex abdominal pain, averaging 45.8% in the United States (95% CI 39.9–51.7) vs 44.7% (95% CI 44.4–45.0) in Ontario.

Conclusion: Americans are nearly twice as likely as Ontarians to undergo a CT scan during an ED visit. Rates of scanning are increasing in both countries, but faster in the United States. All subgroups in both countries experienced increasing rates except for the youngest Ontarian children. The differences in rates were less marked for conditions where CT is commonly indicated: rates for complex abdominal pain were virtually identical in both regions, suggesting utilization is similar when clinical indications are more clear-cut. It is likely that factors besides clinical appropriateness are important drivers of CT rates.

Background: Computed tomography (CT) utilization rates in American emergency departments (EDs) have increased dramatically over the last decade, sparking concerns about rising costs and radiation-induced malignancies. A cross-border comparison of trends could enhance our understanding of factors underlying the increase.

Objectives: To compare rates of ED CT utilization in the USA and Ontario, Canada’s largest province.

Methods: This was a retrospective observational population-based study using a systematic survey in the U.S. (NHAMCS) and administrative health databases in Ontario for the years 2003–2008. ED CT utilization rates were determined overall and by patient characteristics. Rates were compared for four pre-specified clinical indications where CT is a common first-line diagnostic imaging test: headache, abdominal pain, chest pain/shortness of breath, and ‘complex abdominal pain’ (age >=65yrs, high-acuity triage, and admitted to hospital).

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between 1998 and 2007. Using pre-assigned “reason for visit” codes, a cohort of headache visits was identified. Imaging characteristics and frequency were recorded by year to evaluate trends. Adjusted odds ratios (ORs) with 95% confidence intervals were calculated over a five-year period (2003–2007) to identify variables associated with a diagnosis of intracranial pathology.

**Results:** Between 1998 and 2007, the percentage of patients with atraumatic headache who underwent imaging in the ED increased from 12.2% to 26.1% (p<0.01), while the diagnostic yield of imaging for serious intracranial pathology decreased from 10.5% to 3.4% (p=0.05). Length of ED stay was 4.6 hours (95% CI 4.4–4.8) for headache patients who received imaging vs. 2.7 (95% CI 2.6–2.9) for those who did not. Of 21 factors evaluated in headache patients, nine were associated with an increased odds of a diagnosis of intracranial pathology: age over 50, arrival by ambulance, triage immediacy <15 min; systolic blood pressure over 160 mmHg; dizziness (vertigo or presyncope), and disturbance in sensation, vision, speech, or motor function. Together, these factors were 95% sensitive (95% CI 87–100) and 41% specific (95% CI 36–46) for detection of intracranial pathology among the atraumatic headache ED population.

**Conclusion:** EDs in the United States have witnessed increased imaging utilization for emergent evaluation of atraumatic headache over the past decade, which is associated with decreased diagnostic yield of testing, increased exposure to ionizing radiation, and greater health care burden. Improved imaging guidelines would help limit costs, ED crowding, patient anxiety, and radiation exposure.

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**394 Computerized Tomography Use in the Pediatric Emergency Department From 2003 - 2010: Changes in Utilization Patterns**

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Emory University - Children’s Healthcare of Atlanta, Atlanta, GA

**Background:** There is increasing scrutiny of computerized tomography (CT) utilization in children due to potential radiation-induced malignancies. Recent studies in adults have shown that CT utilization in the emergency department is continuing to increase but limited data exist concerning trends in children.

**Objectives:** Evaluate the utilization of CT scans in the pediatric ED over time to determine if rates may have changed in correlation with increasing awareness of radiation risks.

**Methods:** All visits to two tertiary care PEDs from 1/2003 to 11/2010 were evaluated retrospectively. All patients less than 18 years old who had a CT performed in the PED were identified and categorized by the type of CT ordered. CT rates were normalized per 1000 patient visits. Demographic variables (age, sex, insurance status) and acuity variables (PED disposition, Emergency Services Index [ESI] triage level) were extracted from the medical record. We compared rates with linear regression techniques.

**Results:** There were 997,002 total patient visits to the study PEDs during the 7-year period. 57,823 patients (5.8%) had a CT scan performed. Head CTs comprised 66.4% and abdomen/pelvis CTs accounted for 24.4%. The overall rate of CT utilization increased from 53.4 per 1,000 patients in 2003 to a peak of 66.3 per 1,000 patients in 2006 (β 3.8, 95% CI 2.4 to 3.2), with a rate decline from 2008 to 2010 of 66.3 per 1,000 to 48.3 per 1,000 (β −1.1, 95% CI −2.2 to −0.6). The rate of head CTs increased similarly from 37.5 per 1,000 patients in 2003 to a peak of 42.3 per 1,000 patients in 2008 (β 2.2, 95% CI 1.3 to 3.1). Since 2008, the rate of head CTs has decreased to 34.0 per 1,000 (β −1.02, 95% CI −2.5 to −0.5). Similar trends with a peak rate in 2008 and a decline since then are seen in CTs of all other anatomic sites.

**Conclusion:** In a large cohort of pediatric ED patients, the overall CT utilization peaked in 2008 and has since declined to levels lower than those seen in 2003. This is the first large cohort study to show a decrease in CT utilization in recent years and may be related to increased awareness of radiation risk in children.

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**395 Elderly Emergency Department Patients With Pain Are Less Likely to Receive Pain Medication: Results From a National Survey 1999–2008**

Timothy F Platt-Mills, D L Brown, Andrey V Borstov, and Samuel A. McLean
University of North Carolina, Chapel Hill, NC

**Background:** The number of elderly adults in the United States will increase by over 75% in the next 20 years. Emergency departments (EDs) are a common source of care for elderly individuals with acute pain due to injury or illness. Single site studies have described oligoanalgesia in elderly ED patients with specific conditions such as extremity fracture and musculoskeletal pain, as well as for pain-related visits in general.

**Objectives:** We evaluated cross-sectional national survey data on ED visits over 10 years (1999–2008) collected by the National Hospital Ambulatory Medical Care Survey (NHAMCS) to determine whether elderly patients presenting with pain were less likely than younger patients to receive any analgesic medication or an opioid.

**Methods:** Proportions of patients receiving analgesics and opioids were compared for four age group categories (18–44, 45–64, 65–74, and 75+), and results were stratified by pain severity. Multivariable logistic regressions were used to adjust for pain severity, sex, and race. All analyses were conducted using survey weights provided by NHAMCS.

**Results:** Pain-related visits accounted for 95,514 (38%) of 254,355 visits by patients 18 or older during the 10-year period. There were 8,998 pain-related ED visits by patients 75 or older, representing an estimated 3.1 million US ED visits annually. Patients age 75 or older were typically female (66%) and white (82%), and most reported moderate or severe pain (67%). Patients age 75 or older with a pain-related visit were less likely to receive any analgesic (49%, 95% CI 48%–50%) than patients 18–44 (66%, 95% CI 65%–66%), 45–64 (63%, 95% CI 63%–64%), or 65–74 (55%, 95% CI 53%–56%). The same pattern of oligoanalgesia was seen for opioid medication. No analgesic medication was given to 48% of patients 75 or older with moderate pain vs. 32% of patients 18–44 and 30% of patients 75 or older with severe pain vs. 23% of patients 18–44. Differences in rates of analgesic and opioid prescribing persisted after statistical adjustment for pain severity, sex, and race, with patients 75 and older significantly less likely to receive pain medication (adjusted odds ratio [OR] for any analgesic 0.523, 95% CI 0.523–0.524; adjusted OR for opioid 0.740, 95% CI 0.739–0.740).

**Conclusion:** Elderly adults who present to the ED with pain are less likely to receive pain medication than younger patients, even after controlling for pain severity.
396 Functional, Mobility, and Psychological Consequences of Minor Injury Among Independent Seniors 3 to 6 Months Post-injury: Results of a Canadian Prospective Study
Marie-Josée Sirois1, Marcel Émond1, Marie-Christine Ouellet2, Jeffrey Perry3, and Raoul Daoust4
1CHA, Hôpital Enfant-Jésus, Québec, QC, Canada; 2CIRRIS, Québec, QC, Canada; 3Ottawa Hospital, Ottawa, ON, Canada; 4Hôpital du Sacré-Coeur, Montréal, QC, Canada

Background: Independent seniors treated for minor injuries in emergency departments (EDs) may experience mobility decline up to 6 months post-injury. Our objective was to document this phenomenon in Canadian seniors.

Objectives: To assess and describe functional, mobility, and psychological status of independent seniors at the ED visit and at three and six months post-injury.

Methods: A prospective study is currently conducted in Canadian EDs among independent seniors (≥65 yrs) with minor injuries. Assessments are performed in the EDs and at 3 and 6 months. Functional, mobility, and psychological status are measured by the Older American Resources and Services (OARS) scale, the timed “up-and-go” (TUG), and the “fear of falling” scale.

Results: To date, among 246 enrolled patients, 134 and 96 have completed the 3 and 6 month follow-ups. Individuals were aged 65–74 (48%), 75–84 (38%), and 85 + (14%); 41% were men. Minor injuries included contusions (66%), lacerations (23%), sprains (23%), fractures (16%), and minor head injuries (25%). At three and six month follow-up, 13% and 15% of individuals had lost significant function in ADLs. Individuals who lost function had a slower TUG (p<0.01) and were more fearful of falling while performing their ADLs (p<0.01) both at the initial ED visit and during follow-up. Moreover, 25% of them had an unplanned ED visit or hospital admission during follow-up.

Conclusion: Minor injuries are associated with functional decline in 15% of otherwise independent seniors that is evident 3–6 months post injury. Better risk assessment and management tools are needed to address the needs of this population.

397 Cognitive Functioning in Independent Elderly Patients Treated for Minor Injury in the Emergency Department
Marie-Christine Ouellet1, Marie-Josée Sirois2, Marcel Émond2, Jeffrey J Perry3, and Raoul Daoust4
1CIRRIS, Quebec, QC, Canada; 2Unité de recherche traumatologie-urgence et soins intensifs, Quebec, QC, Canada; 3Ottawa Health Research Institute, Ottawa, ON, Canada; 4Hôpital du Sacré-Coeur, Montréal, QC, Canada

Background: Although good recovery is expected for most independent elderly patients presenting to the emergency department (ED) with minor injuries, this trauma may represent a sentinel event for detecting underlying functional or cognitive decline. Furthermore, cognitive impairment could influence understanding, retention, or application self-care recommendations such as instructions for rest, medication use, or wound care.

Objectives: The objectives of this study were to: (1) document cognitive functioning in independent elders treated in the ED for minor injuries (e.g., fractures, lacerations) and discharged back to the community, (2) examine how cognitive functioning evolves from the initial injury up to 6 months post-injury, and (3) compare cognitive functioning in elderly individuals who do and do not experience functional decline following a minor injury.

Methods: Design: A prospective cohort composed of 246 persons 65 years and older, independent in basic activities of daily living, admitted to the EDs of three Canadian trauma centres. Outcomes: Cognition was evaluated by research nurses within 72 hours with the Montreal Cognitive Assessment (MoCA), and at 3 and 6 months post-ED visit. Functional decline was defined as a two-point decrease on the Older American Resource and Services (OARS) scale. Data analyses were realized by univariate comparisons.

Results: Within 72 hours of the minor injury, 62.2% of the sample had a MoCA score below the 26-point cut-off suggestive of at least mild cognitive impairment. At the initial, 3 month, and 6 month visits, mean MoCA scores were, respectively, 23.10 (SD=4.27), 24.86 (SD=4.09), and 25.31 (SD=3.61), and these improvements were statistically significant (p<0.01 for all time point comparisons). Individuals who experienced functional decline showed less improvement in MoCA scores. Even if MoCA scores may be influenced by the short-term effects of injury (pain, ED environment) or by learning effects, at least half of independent elders discharged home after a minor injury seem to have some level of impairment in cognition even 6 months after the injury.

Conclusion: Visits to the ED are missed opportunities for the evaluation of cognition and potential functional decline and for referral to existing preventive resources. Appropriate screening tools should be studied for independent injured elders.

398 Pain Management in Older Adults Presenting to U.S. Emergency Departments After Motor Vehicle Collision
Timothy F Platts-Mills, D L Brown, Andrey V Bortsov, and Samuel A. McLean
University of North Carolina, Chapel Hill, NC

Background: Motor vehicle collisions (MVCs) are one of the most common causes of civilian trauma, and motor vehicle collisions involving elderly individuals are rapidly increasing. By 2030, over 2 million police-reported collisions in the United States each year are expected to involve elderly drivers.

Objectives: We examined emergency department (ED) visit data (1999–2008) from the National Hospital Ambulatory Medical Care Survey (NHAMCS) to determine whether elderly patients seen in the ED following MVCs are less likely than younger patients to receive pain medication.

Methods: Associations between age category and ED analgesic administration were assessed using chi-square and logistic regression analysis of weighted data.

Results: Individuals age 18 or older had 5,733 ED visits due to MVCs, representing an estimated 1.9 million visits each year. Individuals 65 or older had 465 ED visits due to MVCs, representing an estimated 150,000 visits each year. The probability of receiving pain medication in the ED declined consistently with age: 18–44=72% (95% confidence interval [CI] 71% to 74%); 45–64=68% (95% CI 67% to 71%); 65–74=65% (95% CI 59% to 70%); ≥75=55% (95% CI 46% to 60%) (p<0.001). No analgesic medication was given to 34% of patients 75 and older documented to be in moderate or severe pain vs. 18% of patients 18–44 with moderate or severe pain. Opioids and NSAIDs were given to 28% and 20% of patients 75 and older vs. 28% and 45% of patients 18–44, respectively. Both patients 65–75 and patients 75 and older who had experienced MVCs were less likely than younger patients to receive analgesics after adjustment for sex, race, and pain severity (p<0.001).

Conclusion: Elderly adults who present to the ED following a common form of trauma are less likely to receive pain medication than younger individuals, even after controlling for pain severity. Better pain management strategies for older adults experiencing MVCs are needed.
Comparison of Bag-valve-mask Hand-sealing Techniques in a Simulated Model

David Otten1, Michael M Liao2, Bob Wolken2, Ivor Douglas2, Ramya Mishra1, Mandy Kao2, Whitney Barrett2, Erin Drasler2, and Jason Haukoos2
1University of Colorado School of Medicine, Aurora, CO; 2Denver Health Medical Center, Denver, CO

Background: A modified two-handed bag-valve-mask (BVM) technique that uses the thumb and thenar eminence to push downward and the stronger third finger to pull upward has been proposed to create a potentially tighter seal when compared to other, more conventional techniques. No studies have compared these techniques.

Objectives: To compare the ability of one-handed (1h), two-handed (2h), and modified two-handed (m2h) sealing techniques in preventing air leakage during BVM ventilation using a simulated model.

Methods: This was a prospective, cross-over study in which health care providers were tested on the 1h, 2h, and m2h BVM sealing techniques for 5 minutes each with 3 minutes rest between techniques. All subjects started with 1h and then the order of 2h or m2h was randomized. Outcome was expired tidal volume (Tve) expressed as a percentage of maximum possible Tve over the 5 minute period. A semi-closed system was created using a standard airway trainer head, mechanical test lungs, and a specialized monitor was placed inline between the ventilator tubing and the BVM to measure the Tve. Subjects were blinded to the purpose of the study and the only feedback provided was the rise and fall of a mechanical lung connected to the model. We used a constant tidal volume of 600 cc at 20 breaths/minute. Peak inspiratory flow and lung compliance were held constant.

Results: We enrolled 44 subjects; 22 (50%) were male, and 24 (55%) had experience with ≥ 5 actual emergent BVM situations. Median Tve percentage for 1h was 33% (IQR 7%, 55%), 2h 82% (IQR 71%, 94%), and m2h 85% (IQR 75%, 93%). The 2h and m2h techniques were significantly better than 1h but equal compared to each other (median Tve percentage difference between 2h and 1h was 46% [95% CI 33%, 63%], m2h and 1h was 58% [95% CI 29%, 68%]; and m2h and 2h was 0.2% [95% CI 2% – 3%]). Female subjects performed worse than male subjects within each technique except the m2h (median Tve percentage difference between male and female for 1h was 29% [95% CI 6%, 50%]; 2h was 15% [95% CI 4%, 26%]; and m2h was 7% [95% CI 1% – 16%]).

Conclusion: Our results suggest that both 2h and m2h are superior to 1h in preventing air leakage during BVM. Moreover, female operators achieved tidal volumes comparable to their male counterparts using the m2h technique, which was not the case using the other methods.

Comparison of Airway Management by Physicians Using the Glidescope Video Laryngoscope, the Storz C-MAC Video Laryngoscope, and Direct Laryngoscopy in Simulated Difficult Adult Airways

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Background: Video assisted laryngoscopy (VAL) has the potential to revolutionize the management of the difficult airway. The Glidescope® (GVL) and the STORZ C-MAC® (C-MAC) are two leading devices currently available on the market, and have never been compared directly in simulated difficult airways.

Objectives: Compare the effectiveness of direct laryngoscopy (DL), GVL, and C-MAC in the management of the difficult adult airway by physicians using high fidelity patient simulators as measured by overall success rates, time to tube placement, the quality of the laryngoscopic view obtained using the Cormack and Lehane (CL) grading scale, and the overall ease of use.

Methods: This was a prospective observational study comparing success rates and intubation times between two VAL systems and DL. Emergency physicians (EPs) were recruited during routine departmental training. All subjects first underwent introductory training. They were then evaluated on their ability to successfully manage the simulated difficult airway and perform endotracheal intubation. Participants were randomized to either airway technique using DL, GVL, or C-MAC in a high-fidelity manikin with a swollen tongue. Participants then went through the same scenario and secured the airway by the other two methods. Participants were asked for CL view for each modality as well as ease of use on a 10-point rating scale (1=hard, 10=easy). Data were analyzed using t-test.

Results: Nineteen physicians completed the study. Participants were able to successfully intubate more often with either VAL system than with DL (GVL 95% vs. DL 42%, P = 0.001 and C-MAC 95% vs. DL 42%, P = 0.001). Average time to intubation was worse in DL compared to either VAL system (DL 114 ± 84 sec vs. GVL 54 ± 29 sec, P = 0.01 and DL 114 ± 84 sec vs. C-MAC 48 ± 49 sec, P = 0.019). The average CL score was worse in DL than with either VAL system (DL 3.158 vs. GVL 1.47, P < 0.0001 and DL 3.158 vs. C-MAC 1.38, P < 0.0001). Average reported ease of use was better for either VAL than for DL (DL 2.316 vs. CL 7.89, P < 0.0001 and DL 2.316 vs. C-MAC 8.263, P < 0.0001).

Conclusion: Both VAL systems are significantly superior to DL in the management of the simulated adult difficult airway as measured by intubation success rates, time to intubation, laryngoscopic view obtained, and subjective ease of use. There was no statistically significant difference in performance between the GVL and the C-MAC in this pilot study.

Availability and Use of Continuous Waveform Capnography for Endotracheal Tube Confirmation in Emergency Departments: Are We Ready for the 2010 American Heart Association Guidelines?

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Background: The 2010 American Heart Association guidelines include a Class I recommendation for “the use of quantitative waveform capnography for confirmation and monitoring of endotracheal tube (ETT) placement”. The 2010 American Heart Association Guidelines?

Objective: This study seeks to identify the prevalence of waveform end-tidal carbon dioxide (ETCO2) monitors in the emergency departments (EDs) within our state and the rate at which these EDs use waveform ETCO2 for confirmation of ETT placement.

Methods: A structured survey was conducted by telephone of all licensed EDs within the state to determine whether waveform ETCO2 was available within the ED and, if available, how it was used during verification of ETT placement.

Results: One hundred forty-nine (91%) of the state’s EDs participated in the survey. Only 70/149 (47%) had waveform ETCO2 available within the ED. Waveform ETCO2 devices were found to be more available in accredited trauma centers 18/26 (69%) vs non-trauma centers 52/123 (42%). The primary reason given for not having waveform ETCO2 available was cost. Colorimetric ETCO2 was the most common alternative to waveform ETCO2. Of the EDs that had waveform ETCO2 available, only 25/70 (35%) reported “always” using the device for ETT confirmation. Of the EDs that reported “always” using this device for ETT confirmation, 8/18 (44%) were trauma centers and 17/52 (32%) were non-trauma centers. “Physician preference” was the most common reason for not using waveform ETCO2 when it was available.

Conclusion: In this state, most EDs lack the availability of waveform ETCO2 monitors. Of those EDs that have waveform ETCO2 available, it is being underutilized for confirmation of ETT place-
ment. The reported failure to provide and use waveform capnography when confirming ETT placement exposes ED patients to the potential for delayed recognition of misplaced esophageal ETTs.

**Objectives:** To assess the accuracy and timeliness of using tracheal ultrasound to examine endotracheal tube placement during emergency intubation.

**Methods:** This was a prospective clinical reliability study, conducted between March 2010 and September 2010. Patients received emergency intubation because of impending respiratory failure, cardiac arrest, or severe trauma. The tracheal rapid ultrasound exam (T.R.U.E.) was performed during emergency intubation, with the transducer placed transversely over the suprasternal notch. The primary outcome was concordance between tracheal ultrasound and capnography. Quantitative waveform capnography was used as the criterion standard for tracheal intubation confirmation in cadaveric models and on patients in well-controlled environments. Few studies were conducted in emergency settings, so that validation of this potentially useful technique in emergency settings is urgently needed.

**Results:** We enrolled 102 patients, and 15 (14.7%) were esophageally intubated. The median time to intubation was 15.3 ± 19.5 seconds (interquartile range [IQR]: 5.0, 15.3), and 78.8 ± 80.3 seconds (IQR: 31.0, 150.2). The sensitivity, specificity, positive predictive value, and negative predictive value were 98.9% (95% CI: 94.5–99.8%), 80% (95% CI: 71.2–86.6%), 96.6% (95% CI: 91.1–98.8%), and 92.3% (95% CI: 85.5–96.1%), respectively. The mean operating time of the T.R.U.E. and capnography waveforms was 15.3 ± 19.5 seconds (interquartile range [IQR]: 5.0, 15.3), and 78.8 ± 80.3 seconds (IQR: 31.0, 86.0), respectively. The T.R.U.E. was significantly faster than capnography in both the non-cardiac arrest and cardiac arrest patient groups (p < 0.001).

**Conclusion:** The T.R.U.E. is a fast and accurate method for confirmation of endotracheal tube placement during emergency intubation.

**403 Comparison of Time to Intubation, Hypoxia, and Occurrence of Aspiration Pneumonia Between Patients Intubated Using the C-MAC Video Laryngoscope Vs Standard Laryngoscope**

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**Background:** The C-MAC video laryngoscope device provides a video image of a patient’s airway during intubation.

**Objectives:** To determine the time to intubation, the number of attempts, the occurrence of hypoxia, and the subsequent development of aspiration pneumonia in patients intubated with a C-MAC versus those intubated using a standard laryngoscope.

**Methods:** This was a prospective observational study of patients undergoing endotracheal intubation at an urban Level I trauma center conducted from 7/1/2010 until 9/1/2010. The device used on the initial attempt to intubate was at the discretion of the treating physician. Data were collected by a trained research assistant at the patient’s bedside. The device used, the number of attempts made to intubate, the lowest oxygen saturation, and the total time until intubation was successfully accomplished were recorded. The patients’ medical records were reviewed for the subsequent diagnosis of aspiration pneumonia. Hypoxia was defined as an oxygen saturation <93%. Data were compared with Wilcoxon rank sum and chi-square tests.

**Results:** One hundred and seventy-one patients were enrolled; 119 were intubated with a standard laryngoscope and 53 using the C-MAC. The median number of attempts for the standard laryngoscope was 1 (range 1 to 4), and for C-MAC was 1 (range 1 to 5) (p=0.43). The median time to intubation for the standard laryngoscope was 54 seconds (range 7 to 572) and for the C-MAC was 40 seconds (range 4 to 354)(p=0.05). Hypoxia was detected in 18/119 (15%) in the standard laryngoscope group and 11/53 (21%) in the C-MAC group (p=0.73). Aspiration pneumonia was subsequently diagnosed in 23/119 (19%) in the standard laryngoscope group and 7/53 (13.2%) in the C-MAC group (p=0.21).

**Conclusion:** We did not detect a difference in number of attempts, the occurrence of hypoxia, or the diagnosis of aspiration pneumonia between standard laryngoscope and C-MAC. The time to successful intubation was shorter for patients intubated with the C-MAC.

**404 Out-of-hospital Surgical Airway Management: Does Scope of Practice merit Actual Practice?**

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**Background:** Pennsylvania includes out-of-hospital surgical airway management (OOhSAM) within ground paramedic (PM) scope of practice (SoP). However, there is scant literature that evaluates ground PM clinical competency in OOhSAM.

**Objectives:** The goal of this project was to prospectively assess clinical exposure, education, and self-perceived competency of ground PM in OOhSAM.

**Methods:** All 82 PMs employed by four emergency medical services (EMS) agencies for which the authors provide medical oversight completed a 20-question written OOhSAM survey that assessed surgical attempts, training, skills verification, and perceptions about procedural preparedness and competency. Descriptive statistics were used to evaluate responses.

**Results:** 70/82 (84%, 95% CI: 76–91%) subjects classified themselves as full-time PMs and 48/82 (58%, 95% CI: 48–69%) had 10 or more years experience (range 1–30 years). Only 17/82 (20%, 95% CI: 13–31%) have attempted OOHSM (6 needle, 10 commercial device, and 2 “open” cricothyrotomies), 13 (76%, 95% CI: 53–90%) of whom have greater than 10 years experience. 60/82 (75%, 95% CI: 63–82%) subjects answered that they did not believe they are well-trained to perform OOHSM. 50/82 (60%, 95% CI: 50–70%) did not believe they could correctly perform OOHSM on their first attempt. 56/82 subjects (67%, 95% CI: 58–77%) did not know “open” cricothyotomy was even permitted within the state SoP.

Among subjects with five or more years experience, 50/55 (91%, 95% CI: 80–96%) reported 0–1 hours per year of practical OOHSM training within the last five years. 40/79 (51%, 95% CI: 40–61%) subjects who have been through annual skills testing more than once indicated OOHSM proficiency had not been verified within the last five years. 22/55 (61%, 95% CI:33–58%) subjects who had demonstrated procedural proficiency did not believe that the testing process was predictive of whether they could successfully perform OOHSM.
Conclusion: The PMs we surveyed indicated that OOHSAM is rarely performed, even among experienced clinicians. Many PMs believe that both their training in this area and the testing process to demonstrate competency are inadequate. Further study to determine whether or not to modify PM SOP and/or to develop improved educational and/or testing methods is warranted.

405 Comparison of Airway Management by EMS Providers Using the GlideScope Video Laryngoscope, the Storz C-MAC Video Laryngoscope, and Direct Laryngoscopy in a Simulated Difficult Adult Airway

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Background: Video-assisted laryngoscopy (VAL) systems have the potential to revolutionize management of the difficult airway in the prehospital setting. Presently, most prehospital providers are limited to using direct laryngoscopy (DL) or a rescue device for difficult or failed airways.

Objectives: This study evaluated the effectiveness of emergency medical services (EMS) providers managing a simulated difficult adult airway using DL and two VAL systems.

Methods: This was a prospective observational study comparing time to successful intubation among EMS providers using two different VAL systems, the GlideScope® (GVL) and the Storz C-MAC® (C-MAC), versus DL. All participants received a brief tutorial using the GVL and C-MAC. None of the participants had previous experience with either VAL. After training, participants were randomized to orotracheal intubation by DL, GVL, or C-MAC in a high-fidelity manikin with a swollen tongue. Participants then went through the same scenario and secured the airway by the other two methods. Participants were asked for the Cormack-Lehane (CL) view for each modality as well as ease of use on a 10-point rating scale (1=hard, 10=easy). Data were analyzed using the t-test.

Results: Thirty-three EMS providers completed the study. Participants were able to successfully intubate more often with either VAL vs. DL (GVL 97% vs. DL 76%, P = 0.012 and C-MAC 100% vs. DL 76%, P = 0.0002). Average time to successful intubation was higher in DL compared with either VAL (DL 64.6 ± 59 sec vs. GVL 30.6 ± 18.4 sec, P = 0.003 and DL 64.6 ± 59 sec vs. C-MAC 44.7 ± 21 sec, P = 0.078). The average CL score was higher for DL than either VAL (DL 2.9 vs. GVL 1.1, P = 0.0001 and DL 2.9 vs. C-MAC 1.2, P = 0.0001). Average reported ease of use was better for either VAL compared to DL (3.8 vs. 8.9 for GVL, P = 0.0001 and DL 3.8 vs. C-MAC 8.0, P = 0.0001).

Conclusion: Both VAL devices showed higher rates of successful intubations, shorter times to successful intubation, and better CL scores and ease of use compared with DL in a simulated difficult airway. While GVL was faster than C-MAC in time to intubation, rate of successful intubation, ease of use, and CL grade did not show a statistical difference. In this pilot study, both VAL devices provided a broader, more reliable method to securing an airway compared to DL in a difficult simulated airway.

406 Emergency Medicine Resident Anesthesia Training in a Private Practice Versus Academic Setting

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Background: Airway management is an essential skill for emergency medicine (EM) training. Academic medical centers provide anesthesiology training to a variety of learners including anesthesiology and EM residents, critical care fellows, paramedics, nurses, and medical students. This creates significant competition for intubations that may negatively affect learners’ experiences.

Objectives: We hypothesized that residents completing their anesthesiology rotation in a private practice setting, rather than in an academic center, would report higher numbers of intubations and improved educational value to the rotation.

Methods: EM residents were stratified by year and assigned to receive airway training in either a private setting (nine residents, 2009–10 academic year) or an academic setting (eight residents, 2008–9 academic year). Outcome measures included the number of self-reported intubations, resident ratings of the rotation, and the number of positive comments submitted. Resident satisfaction was measured with a 14-item evaluation about the rotation, which residents answered using a 1-4 rating scale (1-low, 4-high). Additionally, residents provided subjective comments about the rotation, which two blinded reviewers rated as positive, negative, or neutral.

Results: The number of intubations increased significantly in the private setting, with residents reporting 4.6 intubations per day compared to 1.5 intubations per day in the academic setting (p<0.001). Resident ratings of the rotation also improved significantly. Residents reported a mean score of 3.83 for questions assessing the private setting compared to a mean score of 2.23 for the academic setting (p-values for individual questions ranged from 0.0001 to 0.024). Residents’ impressions of the rotation also improved significantly, with 100% of comments positive for the private setting compared to 10% positive in the academic setting (p<0.001).

Conclusions: The number of intubations performed and the residents’ rating of the educational value were more favorable for the private practice setting for an anesthesiology rotation. Alternative practice settings may provide benefit for resident education in training areas that have competition among trainees.

407 Bougie-assisted Intubation in Difficult Pediatric Airway Intubations

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Background: While gum-elastic bougie (GEB) use is widespread in adult airway management, there is currently no literature investigating GEB usage in the general pediatric population.

Objectives: The study was designed to evaluate the effects of using a GEB in a simulated pediatric Cormack-Lehane Grade III difficult airway. Time and rate of successful intubation were compared between emergency medicine (EM) and anesthesiology and between attending and resident physicians. The null hypotheses were that there were no differences in failure rate or time to intubation in a difficult airway when (1) a GEB is used vs no GEB (NN) and (2) a Sunmed™ (SM) GEB vs. a Boussignac™ (BB) GEB was used. A secondary hypothesis was that there was a relationship between level of training or specialty and the ability to manage the difficult airway.

Methods: This study was a randomized experimental design. A difficult airway was simulated using a mannequin model. Subjects attempted intubation without a GEB (stylet and endotracheal tube), a SunMed™ GEB, and a Boussignac™ GEB. Subjects were randomized to intubation attempts by level of training or specialty. All subjects used all three methods and served as their own controls. Independent variables were the rate of success and time to successful intubation of a simulated difficult airway. Also recorded for intubations that may negatively affect learners’ experiences.

Results: 56 subjects were included in the study. Success rates were 41/56 (75%) for SM, 43/56 (73%) for BB, and 45/56 (80%) for NN (non-significant). Time to intubation was 32±16 sec for the SM, 22±13 sec for the BB, and 17±11 for the NN group. SM was significantly slower than either BB (diff=11 sec, 95% CI=5,16) or NN (diff=15 sec, 95% CI=10,21).

Conclusion: In a simulated difficult pediatric airway model, there was no difference among the methods. Times to successful
intubation were faster with either no GEB or with the Boussignac GEB, than with the SunMed GEB. There was no statistically significant difference in success rate between EM and anesthesia or between attending and resident physicians. EM residents performed the slowest, especially when using a GEB.

408 Pilot Study of Glucose-Insulin-Potassium for the Treatment of Vasopressor-Dependent Septic Shock

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Background: Glucose-insulin-potassium (GIK) infusion in heterogeneous critically ill populations bolsters the cardiovascular system and attenuates inflammation. To date no study has evaluated the effect of GIK as a treatment in septic shock.

Objectives: To evaluate the safety and preliminary efficacy of GIK infusion as an adjunct therapy in patients with vasopressor-dependent septic shock.

Methods: Prospective, phase I, matched case-control study.

Inclusion criteria: suspected infection, two or more systemic inflammatory response syndrome (SIRS) criteria, cumulative vasopressor index >3. Cases received GIK (25% dextrose, 100 U/liter regular insulin, and potassium chloride 60mEq/liter) at 1.5 cc/kg/hr for 12 hours. Controls received normal saline placebo. The primary safety outcome was the number of related serious adverse events (SAEs) between groups. The primary efficacy outcomes were the change in interleukin-6 (IL-6) levels at 24 hours. Groups were measured by sidestream dark field video-microscopy at 12 hours, and 12 hours, the change in microcirculatory flow index (MFI) measured.

Results: A total of 122 patients were enrolled in the study, after randomization, 59 received midazolam and 63 received etomidate. Of these, 96 (80%) patients met sepsis criteria, and 59 (48%) patients required vasopressors. Patients receiving etomidate had a non-significant increase in likelihood of receiving vasopressors (OR 1.29, 95% CI 0.63 - 2.6). There was no statistically significant difference in mean hours on vasopressors for all patients (33.4, 2 SIRS including white blood cell count, SI > 0.55 for the current analysis, data on vasopressor duration were collected from medical records.

Methods: This was a secondary analysis of data obtained from patients enrolled in a double-blind, randomized study at our hospital. This study compared length of stay between patients with suspected sepsis who were intubated with either etomidate or midazolam in our emergency department over an 18-month period. For the current analysis, data on vasopressor duration were collected from medical records.

Results: There were no occurrences of hypoglycemia or hyperkalemia.

Conclusion: We found no significant difference in duration of vasopressor use between patients who were given etomidate and patients given midazolam in our study sample. These results do not support the contention that etomidate causes significant increases in vasopressor requirements.

410 An Evaluation of Shock Index as a Predictor of Hyperlactatemia and 28-day Mortality in Adult Emergency Department Patients Screened for Severe Sepsis

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Background: Screening for severe sepsis in adult emergency department (ED) patients may involve time delays waiting for blood tests and may lead to missed cases. Shock index (SI), defined as heart rate / systolic blood pressure, requires no blood work. We tested the hypotheses that 1) SI is superior to traditional vital signs and systemic inflammatory response syndrome (SIRS) criteria as a predictor of serum lactate ≥4.0 mmol/L (hyperlactatemia), and that SI is superior to vital signs, SIRS criteria, and hyperlactatemia as a predictor of 28-day mortality.

Methods: We performed a retrospective analysis of a cohort of adult ED patients at New York Hospital Queens, an academic community trauma center with 95,000 annual visits, enrolled from 2/1/2007 to 5/28/2008. Patients were included if they had a suspected infection and were screened for severe sepsis with a unique electronic order set that included triage vital signs, basic lab tests, and a serum lactate level. Test characteristics were calculated for two outcomes: hyperlactatemia (morbidity marker) and 28-day mortality. We considered the following covariates in our analysis: heart rate > 90, mean arterial pressure 20, ≥2 SIRS with vital signs only, ≥2 SIRS including white blood cell count, SI ≥0.7, and SI ≥1.0. We
report sensitivities, specificities, adjusted odds ratios, and the area under the curve (AUC) for each covariate. We compare AUCs using chi-square.

**Results:** 2524 patients had complete records and were included in this analysis. Two hundred and ninety (11.5%) patients had hyperlactatemia and 361 (14%) patients died within 28 days. Results are presented in Table 1. SI >0.7 had the highest sensitivity for both outcomes. For the prediction of 28 day mortality, there was no statistically significant difference in the area under the curve for SI >1.0 and hyperlactatemia (chi-square=0.14, p=0.71).

**Conclusion:** In this cohort, SI >0.7 was the most sensitive screening test for hyperlactatemia and 28-day mortality. SI >1.0 was not statistically significantly different from hyperlactatemia as a predictor of 28-day mortality. Future research should focus on validating these findings in different settings.

| Activated Cytotoxic T Lymphocytes Expressed Increased Levels of Cytolytic Effector Molecules Are Characteristic of Emergency Department Patients With Severe Sepsis and Septic Shock |  |
|---|---|---|---|---|---|---|---|---|---|---|---|--- |
| Anthony M. Napoli, Loren Fast, Fenwick Gardiner, Martha Nevola, and Jason Machan Brown University School of Medicine, Providence, RI |  |

**Background:** Cytotoxic T lymphocytes (CTL) play an important role in host defense and sepsis pathogenesis. Granzymes are serine proteases that induce apoptosis. Perforin, a pore forming protein, facilitates entry of granzymes into the target cell cytoplasm. These cytolytic effector molecules (CE) are a key part of CTL-mediated cell lysis via granule exocytosis. Elevated plasma levels of granzymes in septic patients suggest a role in cytolysis.

**Objectives:** We sought to demonstrate direct evidence of intracellular activation of granzymes A&B (GrA & GrB) and perforin in cytolytic cells of sepsis patients.

**Methods:** Prospective cohort of controls (C), acutely ill inflammatory non-septic illnesses (AINS) with systemic inflammatory response syndrome (SIRS), and patients with severe sepsis or septic shock (SS) (lactate >4, SBP<90 after 2L normal saline). Peripheral blood mononuclear cells were isolated, cell populations analyzed, and intracellular expression of granzymes A & B and perforin quantified via flow cytometry. Thirteen patients per group were estimated to show a 50% increase in CE mean fluorescent intensity (MFI) (two-tail, α=0.05, β=0.08). Generalized linear models for log-normally distributed data were used to compare MFI among groups (represented as geometric mean GMFI, covarying for age, with follow-up comparisons adjusted using the Holm test. Similar models were used to test for an association between APACHE II scores and CE MFI, checking for interactions and main effects with age.

**Results:** Forty patients were enrolled. Relative CTL expression was increased for SS, but not AINS, relative to controls (p=0.02). GMFI of GrB was significantly higher in SS (4.67, 95% CI 4.26–5.08) vs. AINS (3.92, 95% CI 3.40–4.43) or C (3.86, 95% CI 3.30–4.41), respectively (p=0.04, p=0.07). GMFI of GrA in SS patients (4.88, 95% CI 4.52–5.23) was higher than C (4.05, 95% CI 3.66–4.44) but not AINS (4.57, 95% CI 4.24–4.90), respectively (p=0.02 and p=0.14). No significant difference existed in perforin among groups. Both GrA and GrB MFI were associated with APACHE score (p=0.01).

**Conclusion:** CTL are activated in sepsis and express significantly higher intracellular levels of granzyme B than in controls or non-infectious illnesses. Additional work is needed to study how the activated CTL contribute to the severity of sepsis - whether it is by release of soluble CE, lysis of particular subpopulations, or some other mechanism.

**Concordance and Prognostic Value of Central Venous Oxygen Saturation and Lactate Clearance of Emergency Department Patients With Septic Shock**

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**Background:** There remains debate about the relative value of early sepsis resuscitation goals. To date, no study has directly compared central venous oxygen saturation (ScvO2) or lactate clearance (LC) goals in the same patient.

**Objectives:** To determine the prognostic value and concordance of achieving ScvO2 or LC goals in septic shock patients undergoing an early resuscitation protocol in the emergency department (ED).

**Methods:** Preplanned analysis of a multicenter ED-based randomized controlled trial of early sepsis resuscitation targeting three physiological variables: central venous pressure (CVP), mean arterial pressure (MAP), and either ScvO2 or LC. Inclusion criteria: suspected infection, two or more systemic inflammatory response syndrome (SIRS) criteria, and either systolic blood pressure <90 mmHg after a fluid bolus or lactate >4 mM. ScvO2 goal was defined as ≥70%.

**Results:** Simultaneous ScvO2 and LC were measured in 203 patients. Median initial ScvO2 was 80% (IQR 74, 88). Median initial...
lactate was 3.4 mM (IQR 3.4, 5.9). ScvO2 and LC goals were achieved in 167 (82%) and 164 (81%) patients, respectively. 200/203 (99%) patients met either the ScvO2 or LC goal. Overall mortality was 19.7%. If the LC goal was not met, mortality was 10/25 (40%), as opposed to 3/28 (11%) if the ScvO2 goal was not met (proportion difference 29% (6–50%); p=0.13). There were only three cases where neither goal was met, of which one died. Exact test for matched pairs showed no concordance in achieving ScvO2 and LC goals (p=0.77).

Conclusion: In septic shock patients undergoing early resuscitation protocol with simultaneous ScvO2 and LC measurements, there is no significant concordance in goal achievement in individual patients. Failure to achieve LC ≥10% was more strongly associated with mortality than failure to achieve ScvO2 ≥70%.

### 413 Would a Concise Antimicrobial Prediction Protocol (CAPP) Empirically Improve Effective Antibiotic Selection in Severe Sepsis and Septic Shock?

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**Background:** Early delivery of effective antibiotics is essential; yet, due to emerging resistance, antibiotic selection is a challenge. We created an algorithm based on guidelines and previous data for empiric antibiotic administration in the emergency department (ED).

**Objectives:** We hypothesized that adherence to this protocol would improve antibiotic effectiveness defined as administration of an antibiotic with proven in vitro activity based on subsequent culture results.

**Methods:** Retrospective cohort study of ED patients presenting between 1/09–12/09 to two large urban academic centers. Inclusion criteria: 1) severe sepsis and septic shock; 2) ICU admission from the ED; 3) culture positive (blood, sputum, urine, sterile fluids). Patients were initially identified using ICD-9 codes and structured chart review was conducted by trained investigators to confirm that patients met inclusion criteria. All cultures obtained within the first two days that were positive with a non-contaminant organism were included. Regardless of infection source, our protocol recommended different antibiotic regimens based on whether a patient met criteria for health care associated infections (HCAIs) or community-acquired infections (CAIs) (see Table 1). Effective antibiotic selection rates were compared between what was given by emergency physicians (EPs) and what would have been given if a concise antimicrobial prediction protocol (CAPP) were followed. Results are reported with 95% confidence intervals and p-values using Fisher’s exact test.

**Results:** We identified 990 patients by ICD-9 codes; 406 patients met the inclusion criteria. The mean age was 66 +/- 21 years; 56% males, with pneumonia 177 (44%) being the most common source. A total of 282 (69%) patients were culture positive, with 196 HCA and 86 CA infections. EPs’ effective antibiotic selection rate was 78% (221/282) and with CAPP use, would have improved to 94% (266/282), a positive yield of 16% (95% CI 12–20%, p<0.0001) improvement in effective antibiotic selection.

**Conclusion:** Implementation of our CAPP would have improved effective antibiotic prescription rates. Future studies include prospective validation of the use of our protocol and its effect on overall morbidity and mortality and changes in resistance patterns are warranted.

### 414 Utility of Pelvic Computed Tomography Imaging in Pediatric Blunt Trauma

Deborah Marinca, Stacy L. Reynolds, and Alice Mitchell

Carolina’s Medical Center, Charlotte, NC

**Background:** Children routinely undergo computed tomography of the abdomen (CTa) and pelvis (CTp) to diagnose suspected intra-abdominal injury (IAI).

**Objectives:** We hypothesized that CTp significantly increases radiation exposure but contributes to the diagnosis of IAI in less than 2% of pediatric blunt trauma patients without suspected pelvic fractures.

**Methods:** We performed a retrospective study of patients, ages 0–17 years, evaluated at a Level I pediatric trauma center between 2007 and 2009 for blunt abdominal trauma. Exclusion criteria were evaluation for non-accidental trauma and pelvic fractures diagnosed prior to CTp. Duplicate CT images were excluded from effective radiation dose (E) calculations. We defined IAI as solid organ injury, hollow viscus injury, or vascular injury reported to the abdomen (dome of diaphragm to top of iliac crest) and pelvic (iliac crest to greater trochanter). As a secondary outcome, we recorded occult pelvic fractures detected only on CTp. We estimated E based on dose length product (DLP) recorded from the Phillips Stentor iSite program (2005, v3.5.69.1) and age-based radiation coefficients. DLP measurements were corrected for a 32 cm phantom if appropriate. We calculated mean E for combined CTa and CTp studies (Ea) and CTa without CTp studies (Ea). The mean effective dose reduction (Ea-Ep) and percent dose reductions (Ea/Ep) were reported.

**Results:** We identified 512 pediatric blunt trauma patients with CTa and CTp. Of these, 419 (141 female, 241 male) patients met study criteria. Eighty-eight IAI were found in 74 patients. CTp diagnosed IAI in two patients (0.5%, 95% CI -0.18 to 1.14) and detected occult pelvic fractures in 12 patients (3%, 95% CI 1.22 to 4.80). Of the patients with occult pelvic fractures, seven patients had negative pelvic x-rays and five patients did not receive an x-ray. Estimated radiation doses were higher than expected in all but the 0 year group. Duplicate imaging occurred in 38 patients (9%) excluded from the E calculations. Elimination of pelvic imaging reduced E by age group from 25–40%.

**Conclusion:** In this retrospective study, pelvic imaging contributed to the diagnosis of IAI in less than 2% of patients. Estimated radiation doses for combined CTa and CTp were higher than published estimates despite age-adjusted protocols. The utility of CTp in low risk children without pelvic fractures warrants further investigation.

<table>
<thead>
<tr>
<th>Antibiotic Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infection type</strong></td>
</tr>
<tr>
<td><strong>Definition (any one of the following)</strong></td>
</tr>
<tr>
<td><strong>Recommended antibiotic regimen</strong></td>
</tr>
<tr>
<td><strong>HCAIs</strong></td>
</tr>
<tr>
<td>1. IV therapy</td>
</tr>
<tr>
<td>2. IV chemotherapy with in the last 30 days</td>
</tr>
<tr>
<td>Vancomycin PLUS anti-pseudomonal cephalosporin PLUS carbapenem PLUS metronidazole</td>
</tr>
<tr>
<td><strong>CAIs</strong></td>
</tr>
<tr>
<td>Not meeting HCA infection criteria</td>
</tr>
<tr>
<td>Vancomycin PLUS ceftriaxone PLUS levofloxacin</td>
</tr>
</tbody>
</table>
Risk of Intra-abdominal Injury in Children With Blunt Torsos Trauma and Normal Abdominal Computed Tomography Scans

Benjamin T Kerrey1, Alexander Rogers2, Lois Lee3, Kathleen Adelgais4, Michael Tunik5, Stephen Blumberg6, Kimberly Quayle7, Peter E Sokolove8, David H Wisner9, Michelle Miskin10, Nathan Kuppermann11, James F Holmes12.

Background: The emergency department (ED) evaluation of children with blunt torso trauma and normal abdominal computed tomography (CT) scans is often complicated by concerns of occult intra-abdominal injury (IAI), such that many children are hospitalized for observation despite a normal CT scan.

Objectives: To determine the risk of IAI in children with blunt torso trauma after a normal abdominal CT scan.

Methods: We conducted a prospective, multicenter study of children < 18 years old with blunt torso trauma evaluated in EDs, through the Pediatric Emergency Care Applied Research Network (PECARN). We conducted a planned sub-group analysis of those patients with normal abdominal CT scans in the ED, as interpreted by a faculty radiologist. Normal CT scans were defined as the lack of any evidence of IAI, including no intraperitoneal fluid. IAIs were followed for IAI outcomes. We used binary recursive partitioning to create a prediction rule to identify patients at very low risk of IAI requiring therapeutic intervention. CT scanning is typically not warranted for these patients.

Results: Of the 12,044 patients enrolled into the main study, 3,391 (28%) had normal abdominal CT scans in the ED and were included in this analysis. Of these 3,391 patients, 1,480 (44%) were discharged home and 1,911 (56%) were admitted to the hospital. Twelve of 3,391 patients (0.4%, 95% CI 0.2, 0.6%) with a normal ED CT scan identified with later one of the 1,480 discharged patients (0.07%) and eleven of the 1,911 admitted patients (0.6%). Specific IAIs included pancreas (6), gastrointestinal (5), liver (1), and adrenal gland (1). Treatment in these 12 patients included therapeutic laparotomy in three, blood transfusion for abdominal hemorrhage in two, and bowel rest for more than two days in five. There were no deaths due to an IAI in those patients with a normal abdominal CT scan. The negative predictive value (NPV) for IAI of a normal abdominal CT scan was 99.6% (95% CI 99.5, 99.9%).

Conclusion: Children with normal abdominal CT scans in the ED following blunt torso trauma, and no other injuries requiring hospitalization, may be safely discharged home. Appropriate discharge instructions are required, as rarely, an IAI may subsequently become evident.

Identifying Children at Very Low Risk of Intra-abdominal Injuries Undergoing Acute Intervention

James Holmes1, Kathleen Lillis2, David Monroe3, Dominic Borgioli4, Benjamin Kerrey5, Prashant Mahajan6, Kathleen Adelgais7, Angela Ellison8, Kenneth Yen9, Shireen Atabaki10, Jay Menaker11, Bema Bonsu12, Kimberly Quayle13, Madelyn Garcia14, Alexander Rogers15, Stephen Blumberg16, Lois Lee17, Michael Tunik18, Joshua Kooistra19, Maria Kwok20, Larry Cook2, Michael Dean2, Peter Sokolove1, David Wisner1, Peter Ehrlich19, Arthur Cooper21, Peter Dayan22, Sandra Wooton-Gorges1, and Nathan Kuppermann1

1UC Davis School of Medicine, Sacramento, CA; 2State Univ of New York at Buffalo School of Medicine, Buffalo, NY; 3Howard County General Hospital, Columbia, MD; 4University of Michigan School of Medicine and Hurley Medical Center, Flint, MI; 5Cincinnati Children’s Hospital, Cincinnati, OH; 6Wayne State Univ School of Medicine, Detroit, MI; 7Univ of Utah School of Medicine, Salt Lake City, UT; 8Univ of Pennsylvania School of Medicine, Philadelphia, PA; 9Medical College of Wisconsin, Milwaukee, WI; 10The George Washington Univ School of Medicine, Washington, DC; 11Univ of Maryland Medical Center, Shock Trauma, Baltimore, MD; 12 Nationwide Children’s Hospital, Columbus, OH; 13Washington Univ School of Medicine, St. Louis, MO; 14Univ of Rochester School of Medicine, Rochester, NY; 15Univ of Michigan School of Medicine, Ann Arbor, MI; 16Jacobi Medical Center, Bronx, NY; 17Harvard School of Medicine, Boston, MA; 18NYU School of Medicine, New York, NY; 19Helen DeVos Children’s Hosp, Grand Rapids, MI; 20Columbia University College of Physicians and Surgeons, New York, NY; 21Columbia Univ Medical Center at Harlem Medical Center, New York, NY

Background: Use of abdominal computed tomography (CT) in children with blunt abdominal trauma is highly variable due to limited evidence available to clinicians.

Objectives: To derive a clinical prediction rule to identify children with blunt abdominal trauma who are at very low risk for intra-abdominal injuries (IAIs) undergoing acute intervention.

Methods: We prospectively enrolled children (< 18 years old) with blunt torso trauma in 20 emergency departments (EDs) and documented history and physical examination findings onto data forms prior to abdominal CT, if obtained. Patients discharged from the ED were contacted by telephone and hospitalized patients were followed for IAI outcomes. We used binary recursive partitioning to create a prediction rule to identify patients at very low risk for IAI undergoing an acute intervention (therapeutic laparotomy, angiographic embolization, blood transfusion for abdominal hemorrhage, or IV fluid administration for ≥ 2 days in those with pancreatic/duodenal injuries). We considered only historical and physical examination variables with acceptable inter-rater reliability for possible inclusion into the rule.

Results: We enrolled 12,044 patients with a mean age of 9.8 ± 5.4 years; 5,179 (43%) underwent abdominal CT in the ED. Of the 761 patients with IAIs, 203 (27%; 95% CI 24, 30%) had IAI undergoing acute intervention. The derived clinical prediction rule for IAI undergoing acute intervention consisted of: complaints of abdominal pain, history of vomiting, evidence of abdominal wall trauma (including seat belt sign), Glasgow Coma Scale score < 14, abdominal tenderness, evidence of thoracic wall trauma, and decreased breath sounds. The rule identified 197/203 (97%; 95% CI 95, 99%) patients with IAI undergoing acute intervention and had a negative predictive value of 5,029/5,034 (99.9%; 95% CI 99.8, 100%).

Conclusion: We derived a clinical prediction rule consisting of simple clinical variables, which identifies almost all children with IAI undergoing acute intervention. Patients lacking these variables are at very low risk of IAI requiring therapeutic intervention. CT scanning is typically not warranted for these patients.
417 Health-related Quality of Life in the Emergency Department: Measuring Short-term Outcomes in Pediatric Minor Injury
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Medical College of Wisconsin, Milwaukee, WI

Background: Evaluation of comparative effectiveness in pediatric emergency medicine (PEM) is hindered by a lack of appropriate clinical outcome measures. Health-related quality of life (HRQOL) measures are essential in assessing outcome in children with chronic conditions, but there is limited experience with their use as an acute or short-term pediatric outcome measure. The psychometric properties of these scales have not been adequately studied in this acute setting, and must be defined prior to using HRQOL in PEM research.

Objectives: To determine whether the Pediatric Quality of Life Inventory 4.0 Generic Core Scales (PedsQL) is an effective outcome measure in PEM by evaluating the feasibility, reliability, validity, and responsiveness of the acute version of the PedsQL after emergency department (ED) care of minor injury.

Methods: Prospective cohort study following parents and children 2-18 years old for two weeks after PED visit for minor injury.

Results: Three hundred and thirty-two parents and 231 children (5-18 yrs) completed the PedsQL at baseline and follow-up. Internal consistency reliability was good to excellent (α range 0.73-0.93). Known-group comparisons were used to demonstrate discriminant validity. There were strong correlations between negative changes in HRQOL scores and parent/child reports of increasing days of pain and abnormal activity (Spearman’s ρ 0.50-0.69). For patients grouped by injury type and injury location, there were significantly lower follow-up HRQOL scores for fractures vs soft tissue injuries, and for lower extremity fractures vs upper extremity fractures. For clinical outcomes dichotomized as good and poor, there were large negative changes in HRQOL for poor outcome at follow-up, but no negative change for good outcome. To evaluate responsiveness, we looked at the change in PedsQL scores in relation to changes in clinical status over time. Distribution-based indicators of change all supported good responsiveness (effect sizes, half standard deviation estimates of minimal important difference, and the standard error of measurement).

Conclusion: Our results show the PedsQL to be feasible, reliable, and to demonstrate good construct and discriminant validity, and responsiveness in measuring outcome after PED care of minor injury. HRQOL is a promising measure of outcome in PEM clinical research.

418 Pediatric Ankle Sprains: Increased Risk of Reinjury With Early Return to Play
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Medical College of Wisconsin, Children’s Hospital of Wisconsin, Milwaukee, WI

Background: Ankle sprains are one of the most frequently encountered musculoskeletal injuries in the pediatric emergency department (PED). Whereas much is known about general ankle sprain morbidity and reinjury in adults, neither has been described in children. There has been an increase in competitiveness in childhood sports. It is unknown if there is an increase in reinjury when children prematurely return to full activity.

Objectives: To describe ankle sprains in children and to examine the risk of reinjury in those returning to activity with pain.

Methods: Prospective cohort study of ankle sprains in 10 to 18 year olds seen in a PED within 72 hours of injury. History of connective tissue or neuromuscular disorder and multiple lower extremity trauma were excluded. Demographics, injury and exam characteristics were collected at the PED visit. Symptoms, details about return to activity, and reinjury were assessed by phone interview at 3 days, 2 weeks, 3 and 6 months.

Results: One hundred and eighty-five patients have been enrolled, with 5% discontinued for missed or occult fracture, and approximately 20% lost to follow-up over time. To date, 71 patients have completed 6 month follow-up. 44% males; mean age 13.9. 86% are defined as mild or moderately severe sprains. At 2 week follow-up, 18% had full resolution of pain; however, 73% reported return to full activity. At six months, 15.5% of patients had reinjured the same ankle, with 15% of reinjuries occurring within the first three months. In our sample so far, patients who returned to activity while having moderate ankle pain were five times more likely to have reinjury than those returning to play with no or minimal pain (p=0.028).

Conclusion: These mid-study data are impressive for persistence of pain as well as the high rate of reinjury after return to activity with pain. This is previously unreported in children. Adult studies of ankle sprains have shown that incomplete healing or inadequate rehabilitation increase the risk for reinjury. Our study suggests that this may be true in pediatric ankle injuries, as well, when using pain as a marker for incomplete healing. This will be important in determining return to play and follow-up recommendations after PED care.

419 The Location of Emergency Department Visits for Injured Children
Ross J Fleischman, Matthew L. Hansen, David M. Spiro, and Craig D. Newgard
Oregon Health and Science University, Portland, OR

Background: Previous studies have shown great variability in preparedness for pediatric injuries and support regionalization of pediatric trauma care.

Objectives: To determine the distribution of pediatric injury visits among trauma centers, teaching, and urban hospitals.

Methods: This was a population-based, cross-sectional study of pediatric (< 18 years) injury visits defined by ICD9 codes (800-959) from 966 emergency departments included in the 2007 National Emergency Department Sample (NEDS), a 20% national sample representative of all ED visits. Serious trauma was defined by an ICD9-derived injury severity score (ISS) >15. ICD-9 diagnoses, procedure, and cause of injury codes were grouped into meaningful categories according to the Clinical Classification System. Multiple imputation was used to handle missing values, preserve the probability sample, and reduce bias. Cluster, strata, and weights were used to generate confidence estimates for means, counts, and proportions.

Results: The sample contained 6.3 million visits, representing 29.0 million ED visits in 2007, 8.7 million (30.0%) of which were for injuries. Mean age was 9.6 years in the injured and 6.8 years in the non-injured. For all injured patients, 2.9% were either admitted or transferred. Serious injury (ISS>15) occurred in 0.29% of injured children presenting to EDs. 1.5% of severely injured patients died in the ED. Teaching hospitals and Level I-III trauma centers saw 46.2% of minor and 80.1% of severe injuries. Urban EDs (located in a population center of ≥50,000) saw 79.3% of minor and 90.5% of major injuries. Important mechanisms of injury included falls (27.6%), struck by/against (20.6%), cut/pierced (7.0%), overexertion (6.7%), and motor vehicle crashes (6.2%). Combined ED and inpatient charges for injuries averaged $1,659 per patient; $997 for discharged patients and $24,099 for admitted patients. Minor injuries averaged $1,450 per patient. Severe injuries averaged $82,819. The total charges for all injured patients was $14.4 billion.

Conclusion: Although most visits are for minor-moderate injuries, there is a substantial volume and cost associated with pediatric injury. A significant proportion of both minor and severe injuries are seen at facilities that are neither teaching hospitals, Level I-III trauma centers, nor are in urban areas.
Injury Prevention Regarding Child Passenger Safety Among Emergency Physicians With and Without Pediatric Training
Michelle Macy, Sarah J. Clark, and Gary L. Freed
University of Michigan, Ann Arbor, MI

Background: Motor vehicle collisions (MVCs) are the leading cause of death and severe injury among children older than one year of age. More than 90% of children requiring emergency care are treated in general emergency departments (EDs) by physicians without pediatric emergency medicine (PEM) training. It is unknown if emergency physician attitudes and behaviors regarding child passenger safety differ by training background.

Objectives: To compare attitudes and injury prevention behaviors regarding child passenger safety among emergency physicians with general emergency medicine (GEM) or PEM training.

Methods: National mailed survey of 600 GEM and 600 PEM physicians sampled from the American Medical Association (AMA) masterfile. The survey explored attitudes related the ED role in child passenger safety and estimated frequency of injury prevention behaviors in response to common clinical situations. Chi-square analysis was used to compare attitudes and behaviors by training background. Multivariate logistic regression was used to compare behaviors (always/often vs. rarely/never) by training controlling for sex, parent status, graduation year, and practice setting.

Results: Response rate was 61%. PEM physicians were more likely to be female and work in a Level I trauma center. Over 90% of all responding physicians agreed with the statement: “I can say things that make a difference in how parents restrain their child.” PEM physicians perceived a greater role for themselves than GEM physicians in other aspects of injury prevention including: “Parents view me as an expert in passenger safety” (78% vs 64%, p<0.001) and “I feel comfortable answering questions from parents about child safety seats” (87% vs 59%, p<0.001). PEM physicians were most likely to report they would always or often perform injury prevention behaviors after an MVC (see Table 1). Training background remained a significant predictor of behavior in multivariate analyses (see Table 2).

Conclusion: PEM physicians perceive a greater role than GEM physicians in injury prevention around the use of child safety seats. As most children receive emergency care in general EDs, additional work is needed to identify and address knowledge deficits and other barriers to GEM physician involvement in this area of injury prevention.

Table 1: Always/Often Report Behavior in Response to Scenario

<table>
<thead>
<tr>
<th>Scenario: 6 year old restrained front seat passenger being seen in the ED following a minor MVC</th>
<th>% PEM</th>
<th>% GEM</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise parent child is too young to sit in front</td>
<td>91</td>
<td>74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Recommend child uses a booster seat</td>
<td>87</td>
<td>67</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Discuss risk of injury associated with poor seatbelt fit</td>
<td>81</td>
<td>65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Determine if child is big enough to use a seatbelt alone</td>
<td>40</td>
<td>33</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 2: Odds of Always/Often Report Behavior in Response to Scenario by Training Background

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95% CI</th>
<th>AOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise too young to sit in front</td>
<td>3.3</td>
<td>1.9–5.7</td>
<td>1.9</td>
<td>1.0–3.7</td>
</tr>
<tr>
<td>Recommend child use a booster seat</td>
<td>3.2</td>
<td>2.0–5.2</td>
<td>2.4</td>
<td>1.3–4.2</td>
</tr>
<tr>
<td>Discuss risks of poor belt fit</td>
<td>2.2</td>
<td>1.4–3.5</td>
<td>1.7</td>
<td>1.0–2.8</td>
</tr>
</tbody>
</table>

Objectives: To describe characteristics and discharge instructions of school-aged patients evaluated in a children's emergency department (CED) after mild traumatic brain injury.

Methods: This was a retrospective chart review of head-injured children 6 to 18 years evaluated in an urban/suburban community Level I trauma center CED in 2008. Exclusion criteria were intoxication, structural abnormality on imaging, admitted, or expired. One reviewer systematically abstracted data from medical records to a standardized electronic data form including demographics, mechanism, clinical course, discharge instructions, and final diagnosis. Analysis included simple descriptive statistics as well as multivariate methods to compare subgroups for activity restrictions.

Results: Of 352 eligible patients with any head injury diagnosis, 126 were excluded. The 226 included patients were: male 69%, age (years) 6–10 28%, 11–13 23%, 14–18 49%, sports-related 37%. Symptoms included: persistent headache 75%, loss of consciousness (LOC) 33%, dizziness 29%, persistent nausea 27%, amnesia 25%, vomiting 19%, disorientation 16%, and blurred vision 13%. There were no physical signs of head injury in 67% of cases. Imaging occurred for 82% (no acute findings). Concussion-related discharge instructions were given to 61% of patients, but only 34% received activity restrictions and 31% had a concussion-related final diagnosis. Restrictions were more likely for sport-related injury 45% (95% CI: 35%–56%) than non sport-related 28% (95% CI: 20%–35%). Adjusting for age, sex, or LOC did not change this association.

Conclusion: Activity restrictions are more commonly given to patients whose injuries are sports-related; however, the majority of head-injured children are being discharged without restrictions. Given the risks and long-term sequelae associated with untimely return to activity, emergency physicians should adopt evidence-based guidelines to standardize the follow-up plan for these young patients.

Comparison of Two Self-report Pain Scales in Children With a Musculoskeletal Trauma in a Pediatric Emergency Department
Sylvie Le May1, Serge Gouin1, Alexa Messier1, Marie-Andrée Robert1, and Christophe Fortin2
1CHU Ste-Justine, Montréal, QC, Canada; 2UQAM, Montréal, QC, Canada

Background: Current literature highlights a significant deficiency in our ability to assess and treat pain in children even though there are multiple pediatric pain scales available.

Objectives: The aim of this study was to determine the convergence validity and the age-specificity of two self-report pain scales for use with children.

Methods: A prospective study was conducted of all children between 6 and 18 yrs who presented to a university-affiliated pediatric emergency department with a musculoskeletal trauma. Children were recruited to participate in a randomized controlled trial evaluating the efficacy of a combination of codeine and ibuprofen. Children indicated at triage (T1) their current pain intensity on both a visual analog scale (VAS) (0–10 cm) and the FACES Pain Scale-Revised (FPS-R) (6 faces, 0 to 10). Children were then administered an analytic according to protocol and were asked to...
repeat these measurements at 60 (T2), 90 (T3), and 120-min (T4) post-analgesia. Age groups were divided in two (6 to 11 years & 12 to 18 years of age) for analyses. Convergent validity was assessed by determining the Pearson correlation coefficient between the two pain scales at each time period.

**Results:** A total of 81 children were enrolled (n=34 (6–11), n=46 (12–18)). Pearson’s coefficients between both scales at each time were respectively: T1 (0.34, p=0.05), (0.69, p=0.00); T2 (0.69, p=0.00), (0.72, p=0.00); T3 (0.90, p=0.00), (0.55, p=0.00); T4 (0.65, p=0.00), (0.66, p=0.00). Mean pain intensity and SD at each time-period, for both groups with theVAS and FPS-R scales were respectively: T1 (6–11) (5.8 ± 1.4; 6.0 ± 2.0), (12–18) (5.8 ± 1.6; 5.8 ± 2.0); T2 (6–11) (3.9 ± 2.0; 3.9 ± 2.2), (12–18) (4.2 ± 2.3; 3.9 ± 2.5); T3 (6–11) (4.1 ± 2.3; 4.0 ± 2.5), (12–18) (4.0 ± 2.2; 3.5 ± 2.0); T4 (6–11) (4.4 ± 2.3; 4.4 ± 2.6), (12–18) (3.1 ± 2.5; 2.8 ± 2.1). As the reported pain intensity decreased from T1 to T4, the correlations improved for the 6-11 group. Correlations of the 12-18 group, remained positive and strong for T1 and T2, but decreased to moderate at T3 and T4.

**Conclusion:** The VAS and FPS-R exhibit convergent validity that seems to fluctuate according to pain intensity and among age groups. The comprehension of the use of the scales improved with time and decreased pain intensity for the 6-11 year old group. The 12-18 year old group self-report did not seem affected by time and pain intensity.

**423 Impact of EMS MI Team Activation on STEMI Patient Length of Stay and Mortality**

Robert Swor, Carol Clark, Ann McHugh, and Aaron Berman

William Beaumont Hospital, Royal Oak, MI

**Background:** Integrating emergency STEMI response through the continuum from first patient contact to reperfusion has been advocated as a means to improve care.

**Objectives:** Our objective is to assess whether pre-emergency medical services (EMS) arrival MI team activation decreases length of stay (LOS) and improves the outcome of EMS STEMI patients.

**Methods:** Secondary analysis of prospectively collected database of STEMI patients transported by EMS to a single suburban academic community hospital with first EKG positive for STEMI. All cases were reviewed and the presenting EKG, as well as the first EKG that was used for diagnosis of acute STEMI, were analyzed. “True STEMI” was defined as 100% pain ECG, as well as the first EKG that was used for diagnosis of acute STEMI, were analyzed. “True STEMI” was defined as 100% acute STEMI, were analyzed. “True STEMI” was defined as 100% acute STEMI, were analyzed. “True STEMI” was defined as 100% acute STEMI, were analyzed. “True STEMI” was defined as 100% acute STEMI, were analyzed. “True STEMI” was defined as 100%

**Results:** A previous study found that reciprocal ST depression (rSTD) is present in only 82% of inferior ST elevation (STE) acute myocardial infarction (MI). However, we believe that changes in lead aVL are far more sensitive.

**Objectives:** To find the incidence of any rSTD or T-wave inversion (TWI) in angiographically proven inferior STEMI.

**Methods:** We searched the catheterization laboratory database for all cases coded as acute Inferior STEMI from January 2002 through March 2008. All cases were reviewed and the presenting ECG, as well as the first ECG that was used for diagnosis of acute STEMI, were analyzed. “True STEMI” was defined as 100%
occlusion as a culprit lesion with maximum troponin I (troponin I) > 10 ng/ml. STE was measured in leads II, III, aVF; aVL was scrutinized for any rSTD or TWI. TWI was defined as a T-wave mostly down, or a biphasic T-wave that is first down, then up (not up then down, which is associated with lateral AMI). Reperfusion criteria were defined as STE of at least 1 mm in two of three of inferior leads II, III, aVF.

Results: There were 160 unique cases. 107 had 100% occlusion, and 35 had < 100% occlusion, but had a maximum troponin I > 10 ng/ml. For true STEMI, 18 (11%) had < 100% occlusion and a max troponin I > 10 ng/ml. Eighty-five percent of the diagnostic ECGs of true STEMI, and 84% of all cases, met STE criteria. No true STEMI had absence of reciprocal depression in lead aVL. Of the 107 with 100% occlusion, 100 (93%) had at least 0.5 mm of rSTD; the remainder had rSTD of < 0.5 mm. Even among those without true STEMI, 94% had some rSTD in aVL. Additionally, in 44 cases (28%), there was no STE whatsoever on the presenting (first) ECG; all of them had either rSTD or TWI (see the Table).

Conclusion: STE criteria for inferior STEMI are insensitive, especially on the presenting ECG. Changes in aVL, both some amount of rSTD and also TWI, are more sensitive than STE criteria in the diagnosis of inferior STEMI and are nearly universally present in inferior STEMI. These changes also appear earlier than STE.

### Thrombolysis in Myocardial Infarction Risk Score in an Observation Unit Setting

**Joseph B Borawski, Abhinav Chandra, Joshua Broder, Giselle Mani, Weiyiing Drake, Deborah Freeman, and Alexander Linkaking**

**Duke University Medical Center, Durham, NC**

**Background:** The Thrombolysis In Myocardial Infarction (TIMI) score is a validated risk score for risk stratification of acute coronary syndrome (ACS). Some centers use the score as an exclusion criterion for their observation units.

**Objectives:** We hypothesized that the TIMI risk score would be able to risk stratify patients for ACS in patients placed in an observation unit based on physician gestalt.

**Methods:** Retrospective cohort study of consecutive adult patients placed in the chest pain observation unit of an urban academic tertiary care hospital emergency department with an average annual census of 65,000 between 2004 and 2007. Observation unit exclusion criteria included elevated initial cardiac biomarkers, ST segment changes on ECG, unstable vital signs, or unstable arrhythmias; otherwise determination of appropriateness for observation was made by the attending emergency physician. Trained abstractors collected data from electronic records using a standardized report form. Adverse cardiac events including diagnosis of myocardial infarction, percutaneous coronary intervention, coronary artery bypass surgery, or death within 30 days and 1 year were abstracted via chart review and financial record query. The cohort was stratified by TIMI risk scores (0–7) and composite event rates with 95% CI reported using SAS Enterprise Guide 4.2 (Cary, NC).

### Results

In total 2,228 patients were analyzed with an average age of 54.5 years, 42.0% of whom were male. The overall median TIMI risk score was 1. Eighty patients (3.6%) had day and 119 (5.3%) had 1 year adverse cardiac events. The event rates by TIMI scores are reported in Table 1.

**Conclusion:** In an observation unit cohort determined by physician gestalt to be at low risk, the TIMI risk score is able to risk stratify patients in to low, moderate, and high risk groups. This information can assist centers that are developing exclusion criteria for their observation units.

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<thead>
<tr>
<th>TIMI Score</th>
<th>N</th>
<th>Stress Test (%)</th>
<th>Outcome (95% CI)</th>
<th>30 Day Outcome (95% CI)</th>
<th>1 Year Outcome (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>824</td>
<td>4.5</td>
<td>1.21% (0.6–2.15)</td>
<td>1.9% (1.1–3.0)</td>
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</tr>
<tr>
<td>1</td>
<td>592</td>
<td>6.4</td>
<td>3.74% (2.4–5.4)</td>
<td>5.2% (3.7–7.2)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>337</td>
<td>9.8</td>
<td>5.16% (3.2–7.7)</td>
<td>7.6% (5.3–10.6)</td>
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<tr>
<td>3</td>
<td>160</td>
<td>15.0</td>
<td>8.56% (4.9–13.9)</td>
<td>12.8% (8.4–18.5)</td>
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<tr>
<td>4</td>
<td>39</td>
<td>12.8</td>
<td>10.42% (3.4–22.6)</td>
<td>18.8% (8.9–32.6)</td>
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<tr>
<td>5</td>
<td>8</td>
<td>0</td>
<td>25% (3.19–65.09)</td>
<td>37.5% (8.5–75.5)</td>
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</tr>
</tbody>
</table>

426 A New Computer Algorithm Performs Better Than Cardiologists in the Diagnosis of Myocardial Infarction

**Stephen W Smith1, Dorin Panescu2, Ihor Guassak2, Samuel George3, Brian Wenzel3, Goran Simic3, Bosko Bojovic3, Ljupco Hadzievski2, Dhanunjaya Lakkireddy3, Subba Vanga4, Sudha R. Bommana4, and James R. Miner1**

1Hennepin County Medical Center, Minneapolis, MN; 2NewCardio Inc., Santa Clara, CA; 3NewCardio Inc., Santa Clara, CA; 4Kansas University Cardiovascular Research Institute, Kansas City, KS

**Background:** Previous studies of computerized electrocardiogram (ECG) algorithms show poor sensitivity and good specificity for acute myocardial infarction (AMI). Though physician ECG interpreters have consistently performed better than computers, their sensitivity remains low. A new algorithm, my3KG, may improve the initial diagnosis of AMI; this new algorithm processes standard 12-lead ECG input data for quantitative three-dimensional (3D) analysis. It uses several 3-D markers, such as angles between 3-D ECG loops (e.g., QRS-T angles), vectors associated with certain fiducial points (e.g., ST vectors), and morphological aspects of 3-D loops (e.g., planarity of T loops), and combines their values as part of a multi-dimensional statistical classifier to differentiate AMI from non-AMI. This initial version of the algorithm was not designed to differentiate STEMI from non-STEMI.

**Objectives:** We sought to compare the diagnostic accuracy of the new algorithm with physicians in the diagnosis of AMI.
Methods: At one institution, first emergency department (ED) admission ECGs of consecutive patients presenting to the ED with chest pain or discomfort (n = 589) were blinded, randomly sorted, then coded by two cardiologists as STEMI, non-STEMI, or no-AMI. Digital ECG data were provided to the algorithm, which gave a diagnosis of AMI or no-AMI. Outcomes of any AMI (STEMI or non-STEMI) vs. no AMI were adjudicated by other physicians by chart review, including ECGs, troponin, consults, imaging tests, and catheterization reports. Performance characteristics are described with 95% confidence intervals.

Results: Of 589 cases, there were 17 STEMI and 29 NSTEMI for 46 AMI total, and 543 with no-AMI. See the table for diagnostic performances. Only negative likelihood ratio was significantly different, and was better for the algorithm.

Conclusion: This initial algorithm had a significantly better negative likelihood ratio for AMI than the cardiologists.

Performance Characteristics of the New Algorithm, Compared to Two Cardiologists, in Diagnosis of AMI

<table>
<thead>
<tr>
<th>All MI (n=46) vs no-MI (n=543)</th>
<th>Two Cardiologists combined</th>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>51.1 (40.4–61.6)</td>
<td>69.8 (54.2–82.3)</td>
</tr>
<tr>
<td>Specificity</td>
<td>91.7 (89.9–93.3)</td>
<td>88.0 (85.0–90.6)</td>
</tr>
<tr>
<td>(–) Likelihood ratio</td>
<td>6.4 (5.2–7.9)</td>
<td>5.8 (5.0–6.9)</td>
</tr>
<tr>
<td>(–) Likelihood ratio</td>
<td>0.53 (0.50–0.57)</td>
<td>0.34 (0.31–0.38)</td>
</tr>
<tr>
<td>(++) Predictive value</td>
<td>34.5 (31.4–37.8)</td>
<td>33.0 (23.8–43.3)</td>
</tr>
<tr>
<td>(–) Predictive value</td>
<td>95.7 (94.2–96.8)</td>
<td>97.2 (95.3–98.4)</td>
</tr>
</tbody>
</table>

428 Reducing Door-to-balloon Times for STEMI: Effect on Cost and Outcomes

Chad E Darling, Craig S Smith, Peter G Paige, Paula J. Paige, Joshua Lerner, and Jay Cyr
U Mass Medical School, Worcester, MA

Background: Quality improvement programs aimed at reducing door-to-balloon (DTB) times have been shown to improve mortality and decrease length of stay (LOS) for ST-elevation myocardial infarction (STEMI). However, little is known about the effect that these programs have on the cost of care of these patients.

Objectives: The purpose of this investigation was to compare the changes in hospital costs and selected outcomes related to the implementation of a DTB-time reduction program.

Methods: This was a before and after, IRB-approved study conducted in a single tertiary care center. We performed a structured review of data from our hospital’s catheterization laboratory registry and electronic medical records to obtain demographics, comorbidity disease history, DTB-times, LOS, and readmission data. Our primary outcome was inpatient cost with secondary outcomes of LOS, need for rehospitalization within 30 days, and mean DTB times for patients presenting before and after our DTB-time program began in 2006. We included only STEMI patients who both presented primarily to our institution and also had complete financial data in our financial database. Data were analyzed using Students-t or Fisher’s exact tests, as appropriate.

Results: Complete data were available for 189 patients; 60 in the ‘before’ group and 129 in the ‘after’ group. The groups were well-matched with regards to age, sex, and comorbidity disease. Mean DTB-times were 87.8 ± 6.4 versus 57.4 ± 5.5 minutes in the ‘before’ and ‘after’ groups, respectively (95% CI for difference 12.5 - 48.5 minutes, p<0.01). Average inpatient costs in the ‘before’ group were $14,187 ($16,423 when inflated to 2009 dollars [3 years at 4.5%]), while the ‘after’ group was $12,109 ($16,423 when inflated to 2009 dollars [3 years at 4.5%]). These costs decreased to $14,187 ($16,423 when inflated to 2009 dollars [3 years at 4.5%]) for patients in the ‘after’ group. Length of stay was lower in the ‘after’ group (4.5 versus 3.3 days; p=0.03), as were 30 day readmissions (18% vs 15%, OR 1.3, 95% CI 0.58–2.9).

Conclusion: Although we cannot determine a causal relationship, our STEMI quality improvement program reduced DTB-times and was associated with lower inpatient costs and LOS.

429 Marrow-Derived Endothelial Progenitor Cells Are Increased Following Acetaminophen Poisoning

Steven D Salhanick, Moritz Schmelzle, and Simon C Robson
Beth Israel Deaconess Medical Center, Boston, MA

Background: Acetaminophen (APAP)-induced hepatotoxicity is the leading cause of acute hepatic failure in the United States and Europe. Liver regeneration is important for survival and requires regeneration of the hepatic vascular endothelium. Mobilization of marrow-derived endothelial progenitor cells is important after liver resection, and may be important in regeneration after APAP-induced liver injury. Measurement of these cells may serve as a marker for effective regeneration predicting need for transplant while recruitment of these cells may have therapeutic benefit. We report that marrow-derived endothelial progenitor cells defined by surface markers CD133 and CD45 increase in blood and bone marrow following APAP poisoning in mice.

Objectives: To determine if marrow-derived endothelial progenitor cells are mobilized following APAP poisoning.

Methods: All procedures were approved by our Institutional Animal Care and Use Committee (IACUC). APAP toxicity was induced in male C57Bl/6 mice by intraperitoneal injection of 300 mg/kg APAP after a 16 hour fast. Control animals were fasted and received saline. Animals were sacrificed at 24, 48, and 72 hours. Blood and bone marrow mononuclear cells (MNCs) were isolated in a Ficoll gradient and the percent double positive for CD133 and CD45 was determined by FACS analysis. Data were analyzed using ANOVA.

Results: The mean percentage of blood CD133+45+ MNCs increased as follows: 0.37% (+/- 0.46%) at 24 hours; 3.85% (+/- 4.08%) at 48 hours, and 8.6% (+/- 9.31%) at 72 hours post APAP administration. CD133+45+ MNCs were significantly increased at 48 and 72 hours (P<0.05) above control. The mean percentage of bone marrow CD133+45+ MNCs increased as follows: 2.02% (+/- 0.9%) at 24 hours, 2.33% (+/- 0.98%) at 48 hours, and 17.2% (+/- 7.1%) at 72 hours. CD133+45+ MNCs were significantly increased at 72 hours (P< 0.01) above control.

Conclusion: Endothelial progenitor cells defined by surface markers CD133 and CD45 are increased in the blood and bone marrow following APAP poisoning. These cells may serve as a marker for successful regeneration of liver following APAP poisoning. Further, there may be therapeutic benefit in increasing expression of endothelial progenitor cells.

430 Intralipid Fat Emulsion Decreases Respiratory Failure in a Rat Model of Parathion Poisoning

Courtney Dunn, Steven Bird, and Romolo Gaspari
University of Massachusetts Medical School, Worcester, MA

Background: Current therapies exist for acute organophosphate (OP) exposure but the mortality rate remains high (10–20%). Intralipid fat emulsion (IFE) has been used to treat lipo-philic drug ingestions and theoretically would be beneficial for some OP agents.

Objectives: We hypothesize that IFE decreases the respiratory depressant effects of parathion.

Methods: We used a previously validated animal model of OP poisoning with detailed physiologic respiratory recordings. The model consisted of Wistar rats anesthetized but spontaneously breathing 100% oxygen. Airflow, respiratory rate, tidal volume, mean arterial pressure, and pulse rate were digitally recorded for 120 min following OP exposure or until respiratory failure. Three
study groups included paralization alone (n=6), paralization and IFE 5 min post poisoning (n=6), and paralization and IFE 20 min post poisoning (n=6). In all groups, paralization was given as a single oral dose of 54 mg/kg (3x rat oral LD50). Three bolus of IFE (15 mg/kg/min) were given over 3 min, 20 min apart, starting either 5 or 20 min post poisoning. Timing of IFE was based on paralization kinetics. IFE was initiated 5 min post poisoning to coincide with initial absorption of paralization. IFE was given at 20 min to coincide with peak intravenous paralization concentration. Primary outcome was time to apnea. Secondary outcome was percent of animals with respiratory arrest. Student’s t-test and Fischer’s exact test were used where appropriate.

**Results:** Exposed to paralization alone demonstrated a steady decline in respiratory rate and tidal volume post exposure, with apnea occurring 51.6 minutes post poisoning (95% CI, 35.8 min–53.2 min). Animals treated with IFE 5 min post poisoning demonstrated no difference in time to apnea (44.5 min vs 51.6 min, p=0.15) or number of animals with respiratory arrest (100% vs 100%, p=1). Animals treated with IFE 20 min post poisoning demonstrated a significantly prolonged time to apnea (95.3 min vs 51.6 min, p=0.0004) but there was no difference in number of animals with respiratory arrest (100% vs 66.7%, p=0.45).

**Conclusion:** Animals exposed to 3x LD50 of oral paralization demonstrated apnea and respiratory arrest. IFE given immediately after oral paralization does not prolong time to apnea. IFE given 20 minutes after oral exposure to paralization decreases the acute effects of the OP and prolongs the time to apnea.

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**431 Opioid Receptor Polymorphism Associated With Drug Overdose Severity: Pilot Results**

Alex F. Manini1, Michelle M. Jacobs1, Allison Shaber1, David Vlahov2, and Yasmin L. Hurd1

1 Mt. Sinai School of Medicine, New York, NY; 2 New York Academy of Medicine, New York, NY

**Background:** Genetic variations in the mu-opioid receptor mediate individual differences in the human response. A common mu-opioid receptor single nucleotide polymorphism (SNP) A118G has been associated with enhanced drug abuse behavior; however, its association with overdose severity in humans is unknown.

**Objectives:** We evaluated the relationship between the A118G SNP and overdose severity in patients presenting to the emergency department (ED) with acute drug overdose.

**Methods:** In an observational cohort study at an urban teaching hospital, we evaluated consecutive adult ED patients presenting with suspected acute drug overdose over a 5 month period for whom discarded blood samples were available for analysis. Demographics, clinical variables, urine toxicology screens, and adverse outcomes were collected by an abstractor prior to SNP analysis. In-hospital severe outcomes were defined as any of the following: respiratory arrest (mechanical ventilation); cardiac arrest (loss of pulse); and mortality. Blinded high-resolution melt genotyping of the A118G SNP was performed after standard DNA purification (Qiagen QIAamp DNA Blood mini kit) and whole genome amplification (Qiagen REPLI-g). Patients were classified as either wildtype (A/A), heterozygous (A/G), or homozygous mutant (G/G) using LightCycler 480 v1.5 software (Roche).

**Results:** We have to date evaluated 54 patients (43% female, mean age 41, 12 A/A, 40 A/G, 2 G/G). Urine toxicology was positive in 39%, of which there were positives for eight opiates (8 A/G), five methadone (5 A/G), 10 cocaine (3 A/A, 7 A/G), 12 benzodiazepines (3 A/A, 9 A/G), five barbiturates (5 A/G). During hospitalization there were five respiratory arrests (5 A/G), three cardiac arrests (3 A/G), and two died (2 A/G).

**Conclusion:** These pilot data show very high prevalence of the A118G mu opioid receptor SNP in ED patients with acute drug overdose, with no severe outcomes in wildtypes. Future studies will test larger populations and other mutations for overdose vulnerability.

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**432 Use of an Organophosphorus Hydrolase Prevents Lethality in an African Green Monkey Model of Acute Organophosphorus Poisoning**

Steven B. Bird1, Christopher Rosenbaum1, and David L. Ollis2

1 University of Massachusetts Medical School, Worcester, MA; 2 Australian National University, Canberra, Australia

**Background:** Organophosphorus (OP) pesticide poisoning is a leading cause of premature death in the developing world. Despite this burden, no new therapies for OP poisoning have been introduced in over 40 years. Recently, a recombinant bacterial OP hydrolase known as OpdA has shown promise in preventing lethality in rat models of OP poisoning.

**Objectives:** To determine the effect of OpdA on survival, acetylcholinesterase (AChE) activity, and blood OP concentrations in a new African green monkey model of dichlorvos poisoning.

**Methods:** African green monkeys weighing 6–8 kg were fasted overnight. Under general anesthesia the animals had continuous cardiorespiratory monitoring. At time zero, 50 mg/kg dichlorvos in 0.25 mL/kg of peanut oil was given through an orogastric tube. Blood samples for AChE activity and dichlorvos concentrations were taken from a saphenous vein catheter at the following times: before dichlorvos administration, 5, 10, 15, 20, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, and 240 minutes. Negative control monkeys (n=2) were given 0.5 mL/kg of saline immediately after the OP. Test monkeys (n=3) were given 0.45 mg/kg OpdA in a volume of 0.5 mL/kg at the same timepoint. AChE activity was determined by a handheld spectrophotometer. Dichlorvos concentrations were determined by GC/MS. The primary endpoint was survival to 4 hours. Secondary endpoints were AChE activity and dichlorvos concentrations. Animals were euthanized with 100 mg/kg pentobarbital after 20 minutes of apnea or at 4 hours after poisoning, whichever occurred first.

**Results:** In control animals, AChE activity was roughly 12% of baseline at 5 minutes and was non-detectable by 10 minutes. Apea occurred by 6 minutes after poisoning and spontaneous respiration never resumed. In OpdA-treated monkeys, AChE decreased slowly over the 4 hours, remaining above 25% of baseline (a clinically significant value) until 4 hours after poisoning. Dichlorvos concentrations in control animals increased rapidly, reaching a peak of 0.66 mcg/mL at 20 minutes. Dichlorvos reached a peak of 0.20 mcg/mL at 80 minutes post-poisoning in OpdA-treated animals, and was 0.02 mcg/mL at 4 hours.

**Conclusion:** OpdA at a dose of 0.45 mg/kg prevents lethality, maintains AChE activity, and hydrolyzes parent OP compound in a non-human primate model of severe dichlorvos poisoning.

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**433 Assessing Burnout and Resiliency Among an Emergency Medicine Resident Cohort**

Sheryl L. Heron, Philip Shayne, Tiffany Sanders, Rebecca Wurster, and Sally Santen

Emory, Atlanta, GA

**Background:** Physician burnout is associated with low job satisfaction, medical errors, and unhealthy coping behaviors, and is prevalent among resident physicians.

**Objectives:** The objective of this study was to assess the level of burnout and resiliency in an emergency medicine (EM) residency program.

**Methods:** Fifty-seven residents (new interns, rising second and third year residents) were surveyed on paper or via the internet in July of 2010. The response rate was 75%. The surveys were collected anonymously and included the Maslach Burnout Inventory (MBI), the Connor-Davidson Resiliency Scale, Quality of Life (QOL) instrument, and demographic information. The MBI includes three
domains: de-personalization, emotional exhaustion, and low personal accomplishment. By convention, high burnout in either de-personalization or emotional exhaustion is considered to be burnout. Comparisons were made on the rates of burnout and resiliency.

**Results:** The second and third year residents had similar rates of burnout and were combined during the analysis. Burnout was common in EM with 42% of residents scoring high burnout in either emotional exhaustion or de-personalization. More residents than interns had high burnout (21% of interns vs. 61%, p<0.05). Resiliency of the residents was similar to a national sample of adults. Higher resiliency was associated with lower de-personalization and emotional exhaustion burnout regardless of year of training. Interns reported higher QOL. Higher QOL was correlated with lower emotional exhaustion and de-personalization but not low personal accomplishment (R=−0.4 and −0.3, respectively, p<0.005). Sex, race/ethnicity, age, and relationships were not associated with burnout.

**Conclusion:** Measured burnout was highly prevalent in our EM residents, particularly after the first year of training and affected their measured QOL. Burnout was not predicted by sex, age, race/ethnicity, or relationship status. It may be valuable to create a curriculum on wellness or to develop strategies to address the stressors that cause resident burnout which could improve resident resiliency and protect their QOL.

### 434 Measuring Provider Perceptions of Teamwork and Stress During Pediatric Emergency Department (PED) Resuscitations

**Background:** Resuscitations in pediatrics are rare, high stress events. Developments in teamwork training focus on improving patient outcomes through better communication. However, little is known about how health care providers (HCPs) in resuscitations perceive communication, teamwork, and task load. There are scales assessing HCP perceptions of teamwork in the workplace, but none for use directly following care of critically ill patients.

**Objectives:** Develop and evaluate a survey tool to identify common factors influencing HCP perceptions of teamwork and stress when providing critical care in a PED.

**Methods:** Health care providers involved in resuscitations of critically ill patients in the PED were asked to complete a 15 question survey with responses on a five category Likert scale. It was adapted from validated teamwork assessment and task load index tools with modification by a multidisciplinary team to assure content validity. Negatively worded items were reverse coded in data analysis. Exploratory factor analysis (EFA) was performed to identify correlations within responses. A generalized estimating equations (GEE) model was used to account for clustering by resuscitation and emotional exhaustion burnout regardless of year of training. Interns reported higher QOL. Higher QOL was correlated with lower emotional exhaustion and de-personalization but not low personal accomplishment (R=−0.4 and −0.3, respectively, p<0.005). Sex, race/ethnicity, age, and relationships were not associated with burnout.

**Conclusion:** Measured burnout was highly prevalent in our EM residents, particularly after the first year of training and affected their measured QOL. Burnout was not predicted by sex, age, race/ethnicity, or relationship status. It may be valuable to create a curriculum on wellness or to develop strategies to address the stressors that cause resident burnout which could improve resident resiliency and protect their QOL.

### 435 Resident Wellness Within Emergency Medicine Residency Programs: A Survey of Emergency Medicine Program Directors

**Background:** Residency training represents an ideal time to teach young physicians effective wellness tools to use throughout their careers. Despite the amount of literature describing the stressors of residency and effective coping strategies for residents, there is a paucity of literature to assist residency programs with the implementation of an effective wellness curriculum.

**Objectives:** The aim of this study was to perform a needs analysis of emergency medicine residency programs (EMRPs) to aid programs in concentrating their efforts in the development of a formal resident wellness curriculum.

**Methods:** An IRB-approved survey instrument was developed, pilot-tested, revised, and then distributed electronically to program directors (PDs) of U.S. allopathic EMRPs. Data were collected from August through November 2010. The primary response question centered on the current degree of development and satisfaction with their wellness curriculum. Additional questions solicited information on faculty involvement, assessment methods, activities utilized, and perceived needs. Statistics were reported as proportions and means with 95% confidence intervals (CIs) as appropriate.

**Results:** Surveys were sent to 152 programs, and after three reminders, a final response rate of 43% was achieved. The majority of EMRPs do have wellness activities (81.5%, 95% CI 70–90); however, only 1.6% of PDs feel that they have a very well-developed wellness curriculum and/or are very satisfied with their curriculum. Few EMRPs (21.9%) use a standardized evaluation tool and the majority (59.4%, 95% CI 29–54) do not have their residents set future wellness goals. Lectures (85%) and social gatherings (86.7%) serve as the main vehicle for wellness teaching with formal assessment of wellness during the semiannual evaluation. For implementation of a formal curriculum, PDs feel that web/media-based resources and lectures would be useful additions to their curriculum.

**Conclusion:** Although most EMRPs do incorporate wellness activities and teaching, there exists an overall lack of a formalized wellness curriculum and satisfaction among PDs. These results suggest that there is both a need and proclivity for a formal wellness curriculum and resources to effectively assist PDs in optimizing resident wellness within EMRPs.

### 436 Assessment of a Curriculum on Wellness for First Year Residents in Emergency Medicine

**Background:** Physician burnout is significant for resident physicians, but there has been little published on prevention.

**Objectives:** We developed a wellness curriculum specifically to address what are believed to be some of the stressors that impair wellness: time management, dealing with stress, sleep hygiene, and change management. This study evaluated the curriculum focusing on resiliency and wellness for emergency medicine (EM) PGY 1 residents.

**Methods:** A series of one to two hour interactive workshops was developed with local content experts. Each workshop focused not only on knowledge but also on practical strategies individualized for each resident. This curriculum was implemented for all incoming EM and internal medicine interns in the fall of 2010. Workshops included sleep hygiene, time management, stress management, and change management. Three months after completing
Background: Residency is a time of high stress. Characteristics of physician well-being include being married, having spirituality, support systems, self-care, self-awareness, children, and a life philosophy. Burnout among residents has been reported between 25–76%. Scant literature exists in regard to resident stress and its impact on learning and attrition.

Objectives: This study sought to determine if residents who might be out of balance (low margin) in terms of their ratio of burdens/resources may be at greater risk for remediation or attrition. The margin-in-life theory (MIL) suggests if a person’s margin is insufficient margin and utilize characteristics of well-being to stay in training. As females scored lower in some life areas, further investigation is needed to determine if characteristics in the work environment affect women differently.

Results: Ninety-five percent (18/19) of the EM residents completed the program evaluation. Combined, they attended an average of 94% of the five sessions. Satisfaction: 80% of respondents felt the sleep module was helpful, and 100% felt that all the other sessions were useful. Learned: At the end there was a quiz of knowledge; interns averaged 74% correct (range 58% to 100%). Behavior: 88% of residents felt that the wellness curriculum would alter their daily routines. Individual modules varied in effectiveness at changing daily behavior: change management- 100% of interns felt it would alter their routine, stress management 57%, time management 64%, and sleep hygiene 43%. Each intern was asked for strategies for wellness on each module and the frequency of adoption of each habit. On average, the residents adopted at least one strategy daily or weekly.

Conclusion: A wellness and self-care curriculum may assist residents in navigating the rigors of EM training. We hope that this will help mitigate physician burnout, and will continue to follow these residents longitudinally.

437 Application of Margin in Life Theory to Remediation and Attrition Rates Among Emergency Medicine Residents
Colleen Kalynych1, David Vukich1, David Caro1, Vivek Kumar2, Michelle Lott1 and Elena Buzaina2
1University of Florida College of Medicine-Jacksonville, Jacksonville, FL; 2University of North Florida College of Computing, Jacksonville, FL

Background: Residence is a time of high stress. Characteristics of physician well-being include being married, having spirituality, support systems, self-care, self-awareness, children, and a life philosophy. Burnout among residents has been reported between 25–76%. Scant literature exists in regard to resident stress and its impact on learning and attrition.

Objectives: This study sought to determine if residents who might be out of balance (low margin) in terms of their ratio of burdens/resources may be at greater risk for remediation or attrition. The margin-in-life theory (MIL) suggests if a person’s margin is below 0.30 his/her learning may be at risk.

Methods: Eighteen EM residency programs in the southeast were asked to participate. EM residents voluntarily completed an MIL questionnaire measuring life areas: health, spirituality, self-confidence, interdependence, parenting, and EM work. Residents rated an item’s importance (scale 1–10) and that item’s current confidence, interdependence, parenting, and EM work. Residents rated life areas in terms of importance as: interdependence 8.82, self-confidence 8.79, 0% left their training program. Residents reported if they were rated an item’s importance (scale 1–10) and that item’s current confidence, interdependence, parenting, and EM work. Residents reported using exercise (94%), hobbies (89%), and alcohol (71%) as coping methods.

Conclusion: There was low satisfaction with current lifestyle during residency. However, this dissatisfaction was not the result of the perceived work-related stress. Furthermore, undesirable coping methods have been reported, suggesting that training programs could focus on promotion of healthy group activities.

438 Emergency Medicine Resident Wellbeing: Stress and Satisfaction
Wirachin Hoopongsimanont and Scott Compton
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Background: Emergency medicine (EM) involves dealing with multiple sources of stress which can have negative consequences for EM residents.

Objectives: To assess EM residents’ perceptions of stressors and coping mechanisms related to their overall wellbeing, and to assess for differences between PGY levels.

Methods: A literature review identified three themes related to resident stress: 1) work relationship, 2) work environment, 3) patient care. A 44-item online survey, using 5-point Likert scale, was developed incorporating those themes, satisfaction with lifestyle, coping mechanisms, and demographics. Reliability was established using test-retest methods. A stratified random sample of 360 EM residents (120 PGY I, II, and III, each) was obtained from the Society for Academic Emergency Medicine (SAEM) website. Sample size was set to provide an adequate level of precision for estimating the prevalence of EM residents’ stressors and coping mechanisms, as well as a strong power to compare these characteristics among PGY levels. Descriptive statistics and one-way ANOVA were used.

Results: The overall response rate was 109/360 (30.3%). There were 28 PGY-I, 41 PGY-II, and 40 PGY-III respondents of whom 61% were male and the mean age was 30. A 0–4 scale (0 = completely dissatisfied), PGY I reported significantly less satisfaction with lifestyle than PGY II & III (mean rating 1.29, 1.66, and 1.70, respectively; p<0.001). However, there were no significant differences in mean ratings between the PGY level on each of the other stress categories: work relationships (1.37), work environment (1.10), response to patients (1.08). Residents reported using exercise (94%), hobbies (89%), and alcohol (71%) as coping methods.

Conclusion: There was low satisfaction with current lifestyle during residency. However, this dissatisfaction was not the result of the perceived work-related stress. Furthermore, undesirable coping methods have been reported, suggesting that training programs could focus on promotion of healthy group activities.

439 Does Bedside Ultrasound Training Improve Physical Exam Skills in Medical Students Measuring the Liver Span?
Uche Blackstock1, Turan Saul2, William Bagley IV2, Stanley Wu2, and Resa Lewis2
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Background: Bedside ultrasound (BUS) training is newly being integrated into medical school curricula as an innovative modality for teaching anatomy and pathophysiology. Few studies have evaluated BUS training in medical students.

Objectives: To determine if integrating BUS training into the traditional liver physical examination improves accuracy of liver span measurements in fourth year medical students.

Methods: A randomized, convenience sample of fourth year medical students was prospectively enrolled. Twenty-eight study participants were randomized into two groups. Group 1 received a 30-minute didactic session of the traditional examination for vertical liver span (VLS) using percussion/palpation. Group 2 received a 30-minute didactic session of the traditional examination for VLS plus BUS education on integrating BUS with the traditional liver examination. Next, VLS was measured along the mid-clavicular line by percussion/palpation by each medical student in groups
1 and 2 on one volunteer, and separately by two BUS experts. Three VLS measurements each by two BUS experts were averaged and considered the gold standard. We compared the VLS measurements between groups 1 and 2 as well as each group’s VLS average to the BUS gold standard.

**Results:** Group 1 (n=12) obtained a mean VLS of 7.3 cm (SD 1.0) and group 2 (n=16) obtained a mean VLS of 6.8 cm (SD 1.2). BUS experts’ mean VLS measurement gold standard was 9.75 cm. The mean difference between Group 1 and the BUS experts’ was −2.450 cm (95% CI, −3.085 to −1.815) and between group 2 and the BUS experts’ was −2.950 cm (95% CI, −3.589 to −2.311), both p < 0.0001. The mean difference between the two groups was 0.49 cm (95% CI, −1.38 to 0.39). There was no statistical difference between the mean VLS of the two groups (p= 0.61).

**Conclusion:** In our study, BUS training did not improve the accuracy of fourth year medical students’ VLS measurements. Both groups’ VLS measurement difference from the BUS gold standard, but did not differ between the two groups. This suggests that the VLS measurement by percussion/palpation and by BUS may not yield equivalent results. Further studies are needed to help clarify the role of BUS as compared to percussion/palpation in the examination of the liver span.

### 440 Can Support Staff Be Trained to Reliably Use Bedside Ultrasound to Measure Bladder Volumes?

**Objective:** To assess emergency medicine (EM) residents’ confidence and comfort in identifying normal and abnormal findings in an ocular ultrasound examination after an educational intervention comprised of a brief didactic session and simulation practice.

**Methods:** Postgraduate year (PGY) 1–3 residents were administered a survey to assess their pre-intervention comfort level in performing and interpreting ocular ultrasound anatomy and pathology. Participants completed a questionnaire based on a five-point Likert scale (1 = no confidence, 5 = high confidence). After the survey, participants received a short demonstration on performing an ocular ultrasound examination. Subsequently participants were divided into small groups to practice with ocular simulation models. A post-intervention survey comprised of the same questions was then administered. Institutional IRB approval was obtained. Results were analyzed using a Wilcoxon matched-pairs signed-ranks test, with p < 0.05 considered statistically significant.

**Results:** Seventeen out of 17 (100%) of the EM residents present at the conference volunteered for this study. Participants rated their confidence in obtaining a normal scan with an average score of 2.29 pre-training and 4.12 post-training (p=0.0001). Confidence in identifying abnormal ocular findings increased from 1.98 to 3.76 (p=0.0001). Likelihood of performing an ocular ultrasound in the appropriate clinical setting increased from 2.75 to 4.12 (p=0.0002).

**Conclusion:** After a brief training session using our innovative ocular simulation model, PGY1–3 EM residents reported increased confidence in identifying normal and abnormal ocular findings after an educational intervention comprised of a brief didactic session and simulation practice.

### 441 Does the Use of a Novel Ocular Ultrasound Model Increase the Level of Confidence and Likelihood That an Emergency Medicine Resident Will Perform Ocular Ultrasound?

**Background:** Ophthalmologic examinations can be difficult in the emergency setting and bedside ultrasound has become a useful tool in the diagnosis of emergent ocular pathology. We have constructed a simple, inexpensive ocular simulation model for the educational instruction of health care providers to detect normal and abnormal ocular findings. Our goal is to increase both comfort in performing ocular ultrasound and the likelihood of its use in the emergency setting.

**Objectives:** To assess emergency medicine (EM) residents’ confidence and comfort in identifying normal and abnormal findings in an ocular ultrasound examination after an educational intervention comprised of a brief didactic session and simulation practice.

**Methods:** Postgraduate year (PGY) 1–3 residents were administered a survey to assess their pre-intervention comfort level in performing and interpreting ocular ultrasound anatomy and pathology. Participants completed a questionnaire based on a five-point Likert scale (1 = no confidence, 5 = high confidence). After the survey, participants received a short demonstration on performing an ocular ultrasound examination. Subsequently participants were divided into small groups to practice with ocular simulation models. A post-intervention survey comprised of the same questions was then administered. Institutional IRB approval was obtained. Results were analyzed using a Wilcoxon matched-pairs signed-ranks test, with p < 0.05 considered statistically significant.

**Results:** Seventeen out of 17 (100%) of the EM residents present at the conference volunteered for this study. Participants rated their confidence in obtaining a normal scan with an average score of 2.29 pre-training and 4.12 post-training (p=0.0001). Confidence in identifying abnormal ocular findings increased from 1.98 to 3.76 (p=0.0001). Likelihood of performing an ocular ultrasound in the appropriate clinical setting increased from 2.75 to 4.12 (p=0.0002).

**Conclusion:** After a brief training session using our innovative ocular simulation model, PGY1–3 EM residents reported increased confidence in identifying normal and abnormal ocular findings after an educational intervention comprised of a brief didactic session and simulation practice.
442 Ultrasound Education in Allopathic Versus Osteopathic Emergency Medicine Residency Programs
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Background: It is thought that ultrasound education (USE) varies considerably among emergency medicine (EM) residency programs despite general requirements by allopathic (MD) and osteopathic (DO) residency regulatory authorities who mandate “bedside ultrasound” as a requirement. There are no data available regarding the status of USE in DO versus MD residencies. Such information is of particular relevance as ultrasound credentialing in community hospitals becomes more common.

Objectives: Our hypothesis was that USE is similar in MD and DO residencies.

Methods: A phone survey was conducted in 2010 by EM residents who called the emergency department of MD and DO residency programs. There were 40 DO programs and 89 MD programs. Of the 129 respondents, 155 were surveyed about their perceptions of the experience. Descriptive statistics are reported.

Results: One hundred and seventy-six (96%) of 183 students completed the module, and 166 (94%) returned the survey. Prior to the session, 153 (92%) felt the module would enhance their understanding of the anatomical relationships of the abdomen and vascular structures (47%, n=78 strongly agree [SA], 45%, n=75 somewhat agree [SWA]). After completion of the module, 161 (98%, n=164) students reported that it was a valuable educational experience (81%, n=133 SA, 17%, n=28 SWA). 100% (n=165) reported that the learning objectives were achieved. One hundred and fifty-two (93%, n=164) felt the module helped them to better understand the anatomical relationships of the abdomen and vascular structures (54%, n=88 SA, 39%, n=64 SWA). One hundred and forty-seven students (90%, n=164) reported that the case-based format helped to bridge the gap between anatomical knowledge and its application to patient care (50%, n=96 SA, 31%, n=51 SWA). Students reported that they had a better understanding of the application of US in evaluating a patient with blunt abdominal trauma (98%, n=163) (77%, n=126 SA, 21%, n=34 SWA), right upper quadrant / epigastric pain in whom biliary pathology is suspected (80%, n=164) (73%, n=119 SA, 25%, n=42 SWA), and abdominal and back pain in whom abdominal aortic aneurysm is suspected (95%, n=164) (65%, n=107 SA, 30%, n=49 SWA).

Conclusion: Most MS I students felt the addition of a US module would enhance their understanding of anatomical relationships.

443 Introducing Bedside Ultrasound into a Medical School Gross Anatomy Course: What Do Students Think?
David A Wald, Harry Goett, Thomas Costantino, Brett Oxberry, and Carson Schneck
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Background: Bedside ultrasound (BUS) is commonly performed to facilitate emergency department patient care, and is an indispensable skill for emergency medicine residents. It is thought that ultrasound education (USE) varies considerably among emergency medicine (EM) residency programs despite general requirements by allopathic (MD) and osteopathic (DO) residency regulatory authorities who mandate “bedside ultrasound” as a requirement. There are no data available regarding the status of USE in DO versus MD residencies. Such information is of particular relevance as ultrasound credentialing in community hospitals becomes more common.

Objectives: We sought to identify the perceptions of first year medical (MS I) students after an US module was incorporated into a gross anatomy course at one U.S. medical school.

Methods: In 2010, a two hour bedside US module was incorporated into a first year gross anatomy course. The module was case-based and focused on three targeted areas: hepatorenal view, gallbladder view, and aorta view. Students completing the module were surveyed about their perceptions of the experience. Descriptive statistics are reported.

Results: One hundred and seventy-six (96%) of 183 students completed the module, and 166 (94%) returned the survey. Prior to the session, 153 (92%) felt the module would enhance their understanding of the anatomical relationships of the abdomen and vascular structures (47%, n=78 strongly agree [SA], 45%, n=75 somewhat agree [SWA]). After completion of the module, 161 (98%, n=164) students reported that it was a valuable educational experience (81%, n=133 SA, 17%, n=28 SWA). 100% (n=165) reported that the learning objectives were achieved. One hundred and fifty-two (93%, n=164) felt the module helped them to better understand the anatomical relationships of the abdomen and vascular structures (54%, n=88 SA, 39%, n=64 SWA). One hundred and forty-seven students (90%, n=164) reported that the case-based format helped to bridge the gap between anatomical knowledge and its application to patient care (50%, n=96 SA, 31%, n=51 SWA). Students reported that they had a better understanding of the application of US in evaluating a patient with blunt abdominal trauma (98%, n=163) (77%, n=126 SA, 21%, n=34 SWA), right upper quadrant / epigastric pain in whom biliary pathology is suspected (80%, n=164) (73%, n=119 SA, 25%, n=42 SWA), and abdominal and back pain in whom abdominal aortic aneurysm is suspected (95%, n=164) (65%, n=107 SA, 30%, n=49 SWA).

Conclusion: Most MS I students felt the addition of a US module would enhance their understanding of anatomical relationships.
The Use of Emergency Department Ultrasound to Evaluate Ankle Inversion Injuries

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Background: Ultrasound (US) evaluation of the anterior talofibular ligament (ATFL) injuries.

Objectives: Ankle injuries are commonly seen in the emergency department (ED) yet there is little in the emergency medicine literature about methods to accurately rate severity of injury. Currently ED diagnosis relies on physical examination and radiographs. This study was conducted to determine accuracy of US in differentiating between grades 1, 2, and 3 ATFL injury after an inversion type injury, in a timely manner.

Methods: In this IRB-approved prospective study, consent was obtained in every patient with ankle sprains. Patients were treated in a traditional manner and then examined by a different resident or attending physician with US. If obtained, x-rays were blinded from examiners. Investigators evaluated ankle injuries in the ED using US, focusing on the ATFL. Training of the investigators involved a 30-minute US tutorial. Four examiners completed the tutorial and demonstrated appropriate inter-rater reliability on test images. ATFL injuries were classified using the O’Donoghue classification: grade 1—sprain/intact ligament with minimal disruption, grade 2—moderate sprain/partial ligament disruption, grade 3—severe sprain/complete rupture. All US scans and initial ED interpretations of patients enrolled in the study were independently reviewed by a radiologist specializing in musculoskeletal US, which were all blinded to the investigators.

Results: Twenty-three patients were enrolled; among these subjects there were 11 mild, 9 moderate, and 3 severe injuries. The radiologist agreed with 22 of 23 interpretations. US images were performed by ED attending physicians or ED residents. Using the radiologist as the gold standard, the images were examined by a radiologist. The radiologist was given images, with the initial investigator’s assessment.

Conclusion: Ultrasound allows for an accurate ED assessment without significantly delaying length of stay in the ED. US accurately diagnosed ATFL injuries at bedside. Incorporation of this diagnostic modality may allow the ED physician to tailor therapy to the individual needs with nebulous grade 2 or grade 3 sprains. (Originally Submitted as a “Late-Breaker”)

Bedside Ultrasound Protocol Improves Management of Patients Presenting With Non-traumatic Hypotension

Hamid Shokoohi, Keith Boniface, Ali Pourmand, Kabir Yadav, Yiju Teresa Liu, and Venkatesh Bellamkonda Athmaram

Background: In 2005, the American College of Emergency Physicians (ACEP) issued an emergency ultrasound (EUS) fellowship guidelines consensus document. There are no published studies that evaluate ultrasound (US) fellowship adherence to these published guidelines in the United States.

Objectives: To survey 2009-2010 EUS fellows to assess fellowship compliance with the 2005 ACEP EUS fellowship guidelines.

Methods: In this observational study, fellows self-administered a web-based survey distributed via e-mail in May, 2010. Results were analyzed using descriptive statistics.

Results: Seventy-nine percent (46/58) of eligible fellows completed the survey. The ACEP fellowship guidelines delineate (1) site qualifications and (2) minimum criteria for graduation. Fellows identified the following site compliance issues: transvaginal transducer unavailable (4/46 fellows, 11%), no process for hospital credentialing in US (6/46, 13%), working >20 clinical hours/week (6/46, 13%), fellowship director did not perform quality assurance (QA) of all fellows’ scans (23/46, 50%), QA not exclusively of video images (18/46, 39% of fellows spent ≥50% of QA time reviewing still images), fellowship director did not supervise all fellow scanning time (46/46, 100%). On average, fellowship directors supervised 22% of fellows’ scanning time. Compliance issues with the guidelines’ minimum criteria for graduation included: design and start one research project (6/46, 13% non-compliant), first author/presenter on abstract submitted to national conference (30/46, 65% non-compliant). By fellowship end, all fellows felt they would be comfortable performing, interpreting, and teaching the following US applications: renal, aorta, cardiac, trauma, vascular access, skin/soft tissue, and deep venous thrombosis. Forty-five of 46 (90%) fellows were comfortable with biliary and transvaginal intrauterine pregnancy applications. Fewer fellows were comfortable with nerve blocks (28/46, 61%) and testicular exams (29/46, 63%). Fellows reported that additional access to the following opportunities would have improved the fellowship experience: scanning with supervision (16/46, 35%), international US work (14/46, 30%), scanning pediatric patients (12/46, 26%), teaching at US courses (12/46, 26%), and publishing (10/46, 22%).

Conclusion: Focused improvement of the QA process, fellow scanning supervision, and research support may strengthen EUS fellowship programs.

Emergency Ultrasound Fellowship Program Compliance With ACEP Guidelines in 2010: a Web-based Survey

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Background: In 2005, the American College of Emergency Physicians (ACEP) issued an emergency ultrasound (EUS) fellowship guidelines consensus document. There are no published studies that evaluate ultrasound (US) fellowship adherence to these published guidelines in the United States.

Objectives: To survey 2009-2010 EUS fellows to assess fellowship compliance with the 2005 ACEP EUS fellowship guidelines.

Methods: In this observational study, fellows self-administered a web-based survey distributed via e-mail in May, 2010. Results were analyzed using descriptive statistics.

Results: Among 13 faculty raters, experience averaged 7.8 years and 60 images reviewed per week (range 2–15, 5–300). Among all 16 raters, the mean scores were 2.93 (L), 2.12 (Q), 1.62 (A), and 6.68 (T), respectively, Kendall’s correlation coefficients were 0.55 (L), 0.57 (Q), 0.26 (A), 0.63 (T), and 0.45 (U). All URS elements correlated significantly with clinical usefulness (P < 0.001). The Spearman’s correlation coefficients between the clinical usefulness and scoring elements were 0.62 (L), 0.50 (Q), 0.40 (A), and 0.66 (T). The correlation coefficient between each reviewer and the entire group ranged from 0.31 to 0.69 and was higher with more years of experience.

Conclusion: These results suggest that development of a valid URS is feasible. The higher correlation for landmarks and total scores may be an artifact of the wider scale ranges or the more explicit training for landmarks. Next steps: raise the scale ranges to remove difficulties with only 2–3 choices, expand URS training, and add organ systems. A future advance in URS development will be to use scans from individual BUS learners and correlate URS scores with a scan time series because learners should improve over time.
Background: The diagnosis and initial care of the emergency department (ED) patient with shock must be accurate and prompt in order to optimize patient outcomes. However, competing diagnoses may demand opposing treatments, and confirmatory testing may require the patient to leave the ED treatment area. Bedside ultrasound protocols have been proposed as a diagnostic and management aid for patients in shock, but have not been extensively studied.

Objectives: To examine the impact of bedside ultrasound on management of ED patients with non-traumatic hypotension.

Methods: This prospective cohort study at an urban tertiary care academic center studied the effect of an ultrasound hypotension protocol on attending physician management of a convenience sample of patients presenting with non-traumatic hypotension. Data collection included a probability-weighted differential diagnosis and planned diagnostic testing, critical therapies, consultations, and disposition. Physicians were surveyed immediately after initial evaluation, and surveyed again after the hypotension protocol was performed by an expert ED sonographer. The hypotension protocol included estimation of ejection fraction and RV size, diameter and collapsibility of IVC, presence of pericardial effusion/tamponade, pneumothorax, abdominal free fluid, and abdominal aortic aneurysm. Data analysis included use of a validated tool to quantify diagnostic uncertainty (derived from Shannon information theory), with parametric tests of association describing their experience with each of the needles. Data were summarized using descriptive statistics. ANOVA was used to compare means between groups.

Results: A total of 408 US-guided cannulations were performed by 34 subjects. The time from needle stick to dye flash was not significantly different between the two needles (p=0.15), with the standard needle averaging 17.2 seconds (95% CI, 15.2–19.3) and the echo tip needle averaging 15.6 seconds to flash (95% CI, 13.7–17.7). The needle tip was seen at the time of puncture in 79% attempts (95% CI, 68–86) with the standard needle and in 86% attempts (95% CI, 68–86) with the echo tip needle (p=0.103). There was no difference between the two needles for first pass success, total number of attempts, and redirects. The posterior wall was penetrated with the standard needle in 14% of attempts (95% CI, 10–20) and in 6% of the attempts with the echo tip needle (95% CI, 3.5–11); the difference was statistically significant (p=0.02). There was no significant difference between the needles when adjusted for participant experience or confidence level.

Conclusion: In our study, echo tip needles decreased the number of posterior wall penetrations. However, there was no significant difference in other US-guided vascular access metrics.

448 Accuracy of Point-of-care Ultrasound for Hydronephrosis in Patients With Suspected Renal Colic

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Background: Non-contrast CT studies are a first-line test for patients with suspected renal colic. While accurate, CTs consume time, resources, and expose patients to ionizing radiation. Hydronephrosis is readily visible on ultrasound and is a strong predictor of ureteral stone. While point of care ultrasound (POC US) by very experienced sonographers has been shown to be accurate for hydro, the accuracy of emergency physicians (EPs) with a wide variety of US experience has not been studied prospectively.

Objectives: To determine the sensitivity and specificity of hydronephrosis on POC US as compared to CT when performed by physicians with a wide range of experience.

Methods: Prospective observational study of patients presenting during defined periods between 7/19/10 and 1/19/10 to one of two emergency departments (EDs) in an academic medical center with an emergency medicine (EM) residency program. Patients in whom a non-contrast CT study was ordered for suspected renal colic were eligible. After written informed consent, the treating physician performed a POC US and recorded the presence and degree of hydronephrosis prior to CT exam. Following the visit, CT data regarding hydronephrosis and presence of ureteral stones were abstracted from the dictated radiology report by an investigator blinded to the POC US results. Sensitivity and specificity of POC US for hydronephrosis (dichotomized as present or absent) were calculated using the CT scan as the reference standard.

Results: Forty-four patients have been enrolled so far, 64% male, with a mean age of 43.3 years. Twenty-one patients had left-sided flank pain, 22 had right-sided flank pain, and one had bilateral flank pain, yielding data for 45 renal POC USs which were performed by 20 unique sonographers from PGY-1 (following a US rotation) and above. On CT, 47% (21/45) had hydronephrosis and 51% (23/45) had ureteral stones. Sensitivity of US for hydronephrosis as compared to CT was 81% (95% CI = 57–94%), and specificity was 79% (95% CI = 57–92%).

Conclusion: In this academic medical center with integrated US training, POC US by physicians with diverse experience was sensitive and specific for detecting hydronephrosis in patients with suspected renal colic. Future work will focus on incorporating POC US into an algorithm to appropriately reduce CT scanning in suspected renal colic.

(Originally Submitted as a “Late-breaker”)
Background: Radiographs are the standard tool used to diagnose long bone fractures in the emergency department (ED). In a busy ED x-rays can take a long time to obtain and expose the patient to radiation. Previous studies have suggested that bedside ultrasound has good sensitivity and specificity in the detection of long bone fractures.

Objectives: The goal of our research is to investigate whether physicians can accurately diagnose fractures using bedside ultrasound in an ED setting.

Methods: This is a prospective study using convenience sampling. The target sample size is 100 subjects based on a power analysis. All medically stable patients who presented to two academic EDs (Level I and Level II trauma centers) with symptoms consistent with long bone fractures requiring standard radiographs met inclusion criteria. Patients were excluded if they were unstable and there was no time to perform bedside ultrasound prior to taking them to CT scan or the operating room. Subjects first had a bedside ultrasound performed and the presence or absence of a fracture was assessed. A standard radiograph was then ordered and the results of the bedside ultrasound were compared to results of the radiographs. Sensitivity, specificity, and area under the receiver operator characteristics (ROC) curve, along with 95% confidence intervals (CIs), were calculated to assess the accuracy and discrimination of ultrasound compared to radiography.

Results: To date, 53 subjects have been included in our study. An interim analysis of our data shows that ultrasound has a sensitivity of 84.6% (95% CI: 54.6-98.1%) and a specificity of 95.0% (95% CI: 83.1-99.4%) in the diagnosis of long bone fractures. Area under the ROC curve was 0.898 (95% CI: 0.793-0.969). The positive likelihood ratio of a positive ultrasound result was 16.9, and the negative likelihood ratio was 0.162.

Conclusion: Preliminary results from our ongoing prospective study show that ED physicians can accurately diagnose long bone fractures using bedside ultrasound. This could reduce time, cost, and exposure to radiation for patients, especially children. Future directions for our research include the use of ultrasound for reductions in the ED and the use of ultrasound on the sidelines of sporting events to diagnose fractures.

Methods: In this retrospective study, the median LOS on days with a teaching service present was compared with the median LOS on days with no teaching service. A chart review was performed over a 365-day period of ED visits from July 2009 to June 2010. The data were analyzed with respect to the number of patients seen on these days. Further statistical analysis was performed using SPSS (IBM, Armonk, NY) to assess significance using Wilcoxon analysis.

Results: Over a 1-year period, 15,211 patient visits occurred during the studied 8-hour time period. The median LOS on days with a teaching service (with students) was 220 minutes versus 206 without the teaching service. The effect of students in isolation was evaluated on days when the teaching service was present without students: median LOS on these days was 201 minutes (P<0.001, 2 degrees of freedom). The average number of patients seen per shift was 43 with the teaching service (both with and without students) versus 40 without the teaching service. Secondary calculations excluding weekend days resulted in an increase in the median LOS on days with a teaching service to 216 minutes, suggesting a large day selection bias.

Conclusion: A dedicated teaching service with medical students in the ED may increase LOS but increases the number of patients seen, and a teaching service without medical students decreases LOS and increases the number of patients seen. EDs at academic institutions may consider the investment in a teaching service worthwhile, given the small effect this has on patient experience and delay in care.

Background: There has been concern of increased emergency department (ED) length of stay (LOS) during the month of July compared to other months of the year. There are a number of potential contributors including increased work load due to increased patient volume during this time period, staff turnover, and a general increase in the number of patients seen. Some studies have shown increased ED length of stay during July when compared to other months of the year.

Objectives: To determine if the average ED LOS at the beginning of the academic year differs for teaching hospitals with residents in the ED, when compared to other months of the year, and as compared to non-teaching hospitals without residents.

Methods: We performed a retrospective analysis of a nationally representative sample of 283,621 ED visits from the National Hospital Ambulatory Medical Care Survey (NHAMCS), from 2001 to 2008. We stratified the sample by proportion of visits seen by a resident, and compared July to the rest of the year, July to June, and July and August to the remainder of the year. We compared LOS for teaching hospitals to non-teaching hospitals. We used bivariate statistics, and multivariable regression modeling to adjust for covariates.

Results: Our findings show that at teaching hospitals with residents, there is no significant difference in mean LOS for the month of July (275 minutes) versus the rest of the year (259 min), July and August versus the rest of the year, or July versus June. Non-teaching hospital control samples yielded similar results with no significant difference in LOS for the same time periods. There was a significant difference found in mean LOS at teaching hospitals (260 minutes) as compared to non-teaching hospitals (185 minutes) throughout the year (p<0.001).

Conclusion: Teaching hospitals with residents in the ED have slower throughput of patients, no matter what time of year. Thus, the “July Effect” does not appear to a factor in ED LOS. This has implications as overcrowding is a patient boarding problem of concern in our increasingly busy EDs. These results question the need for additional staffing early in the academic year. Teaching hospitals may already institute more robust staffing during this time, preventing any significant increase in LOS. Multiple factors
contribute to long stays in the ED. While patients seen by residents stay longer in the ED, there is little variability throughout the academic year.

453 Effect of Student and Resident Trainees on Markers of Flow in a Mixed Adult and Pediatric Emergency Department
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Background: Academic emergency departments (EDs) strive to offer supervised educational experiences while providing timely clinical care.

Objectives: The purpose of this study was to evaluate the effect of medical student (MS) and resident (RES) trainees on markers of ED flow including length of stay (LOS), door to physician times (DTP), and door to disposition times (DTD) in a mixed adult and pediatric ED.

Methods: Data for this IRB-exempted prospective cohort study were extracted from an electronic patient tracking system. Each ED visit was coded as having been conducted by an attending physician (ATT) alone or an ATT in conjunction with an MS, RES, or a mid-level provider (MID). To evaluate the relationship between being seen by various combinations of providers and LOS, DTP, and DTD times, ordinary least squares regression analyses were performed. To control for the effects of potential confounding factors such as patient acuity and lab or radiographic testing, hierarchical regression models partitioning out these effects were constructed.

Results: During the 5-year study period there were 283,076 visits with 246,142 eligible for study inclusion. Of these, 40,331 (16.4%) were managed by an ATT alone, 13,949 (5.7%) by an MS/ATT team, 153,703 (62.4%) by an ATT/RES team, and 37,540 (15.3%) by MID providers with an ATT physician. The mean LOS for all visits was 246 minutes. The mean LOS for MS, RES, ATT only, and MID visits were 267, 264, 241, and 172 minutes, respectively (F=4250.055, p<0.001). DTD also decreased from MS to MID providers in a linear fashion (F=1909.182, p<0.001). Multiple regression modeling indicated that ED visits managed by trainees were significant predictors of increased LOS (F=28111.057, p<0.001), DTP times (F=3691.211, p<0.001), and DTD times (F=5154.042, p<0.001), after controlling for the confounders patient acuity, lab testing, and radiographic testing.

Conclusion: In our mixed adult and pediatric tertiary care ED, after adjusting for confounders, LOS was approximately 4 minutes longer and 7 minutes longer for patients seen by MS and RES, respectively, than for patients seen by an ATT alone. In addition, being cared for by a trainee accounted for only 2.5% of the variation in LOS observed in the study cohort.

454 Resident Participation in a Process Improvement Initiative Provides Experiential Learning of Systems-based Practice
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Background: The ACGME Outcome Project mandates that residents demonstrate an understanding of systems-based practice. One specific goal is to “incorporate cost awareness and enhance safety/improve quality.” Many residencies use an administrative rotation to facilitate systems-based practice education. Facilitating resident education through process improvement initiatives has been suggested by the ACGME, but examples have not been well-described.

Objectives: Develop an educational intervention to teach EM residents appropriate telemetry utilization and determine the effectiveness to facilitate competency in one area of systems-based practice.

Methods: Academic, tertiary-care, Level I trauma center with 85,000 ED visits, with 48 residents in a PGY 1–4 format divided into junior/senior cohorts. A two-fold educational intervention was implemented: distributed pocketcard plus focused teaching sessions regarding telemetry usage guidelines. The proportions of appropriate telemetry admissions before/after intervention by resident cohort were compared. Univariate association of resident cohort and inappropriate telemetry ordering was tested by the chi-square test and pre/post differences were assessed.

Results: Despite similar ED volumes, a significant reduction in overall telemetry ordering (chi-square = 16.14, p < 0.001) along with a reduction in inappropriate orders (chi-square = 7.29, p < 0.01) were seen. Pre- and post-intervention, juniors improved from 20.3% to 6% inappropriate telemetry orders (95% CI 0.35 to 24.2, p = 0.048) and seniors improved from 27.6% to 11% (95% CI 0.39 to 34.4, p = 0.07).

Conclusion: This brief educational process improvement intervention significantly reduced overall telemetry orders placed by EM residents as well as the proportion of inappropriate telemetry ordering by juniors. This suggests both the importance and feasibility of resident involvement in operational process improvement initiatives to achieve systems-based practice competency during residency.

455 Mind the Big Picture Gap: Resident Handoff Card May Benefit Critical Information Transfer and Prevent Unexpected Outcomes in the Emergency Department
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Background: Effective handoff between residents is essential to ensure continuity of operational effectiveness and to mitigate against the likelihood of adverse events in the emergency department (ED). Ineffective handoff can lead to medical errors, delays in medical diagnosis, life-threatening adverse events, and increased health care expenditure.

Objectives: The objective of this study was to assess resident perception of adequacy of information transfer using a handoff card and factors which predict unexpected outcomes.

Methods: After IRB approval, a prospective pre- and post-intervention questionnaire-based survey was conducted on a convenience sample of PGY1 to PGY3 residents in an inner-city ED over a two-month period. The intervention was a handoff card based on current literature to contain a critical mass of information to use during face-to-face end-of-shift communication. Data on unexpected outcomes were compiled. A logistic regression analysis was conducted using unexpected events as primary outcome with independent variables consisting of missing information. Odds ratios (ORs) are described with 95% confidence intervals (CIs) indicated in parentheses. SAS JMP (Cary, NC) was used for analysis.

Results: A total of 228 patient handoff questionnaires were completed. Use of a resident handoff card increased the likelihood of containing critical information transfer like vital signs OR 11.1 (5.2–23.4), problem list OR 10.5 (4.5–24.6), medications list OR 6.1 (2.9–12.7), awareness about potential complications OR 3.9 (1.4–10.9), and social issues OR 4.4 (2.3–7.1). There was a reduction in unexpected outcomes from 16.8% to 7.3% when a handoff card was provided. Logistic regression showed lack of awareness for potential complications was associated with unexpected events prior to the intervention with likelihood ratio of 2.1 (1.3–3.3) and area under the receiver operator curve of 0.88 (0.70–0.94).

Conclusion: The content, style, and length of ED resident handoffs can be inconsistent, discretionary, and unpredictable due to lack of standardization. Having a structured information tool like the resident handoff card leads to a reduction in unexpected outcomes. It must be designed carefully with incorporation of
Potential complications, thereby providing situational awareness and the ‘big picture’ to incoming ED teams.

456 Effects of Implementing Emergency Medicine Resident-Attending Physician Patient Care Teams on ED Patient Throughput
Lance Hoffman, Richard Walker, Lina Lander, Tyler Price, Robin High, Manjiri Joshi, Michael Wadman, and Robert Muellem UNMC, Omaha, NE

Background: The patient throughput and satisfaction effects of pairing an emergency medicine (EM) resident and attending physician as a care team have not previously been evaluated.

Objectives: We hypothesized that no difference in patient throughput or satisfaction would exist in comparing a resident-attending team and the standard approach of a resident reporting to multiple available attending physicians.

Methods: An IRB-approved, prospective cohort study was conducted at a university, tertiary referral hospital with 21 PGY 1–3 residents. The two-month standard reporting period (July, Aug) was compared to a two-month team-reporting approach (Sept, Oct). Differences in patient availability of patient disposition as reported by residents and attending physicians were assessed using structured surveys and evaluated using logistic regression. The left-without-being-seen (LWBS) rate and patient evaluation times were obtained from the electronic emergency department (ED) patient tracking system and compared for the evaluation times were obtained from the electronic emergency department (ED) patient tracking system and compared for the standard and team-reporting periods using Poisson regression. Patient satisfaction data from standardized outpatient surveys were also compared between the study periods.

Results: The total number of patients treated by residents during the standard and team periods were 5793 and 5429, respectively, (p<0.001), reflecting decreased patient volume. Using a five-point Likert scale for comparison, there were no changes in resident-reported perceptions of attending availability (4.24 v 4.39, p=0.66) and attending-reported resident availability (3.99 v 3.81, p=0.061). Perceptions of patient evaluation efficiency by attending physicians (3.83 v 3.19, p=0.16) and residents (4.37 v 4.35, p=0.98) remained unchanged. With the team-reporting approach, there was a decrease in the LWBS rate (2.01% v 1.54%, p=0.024), door to exam room time (23.9 min v 21.7 min), exam room to physician evaluation time (28.1 min v 24.0 min), length of ED stay (LOS) time for discharged patients (172.5 min v 170.1 min), and LOS for admitted patients (330.0 min vs. 323.3 min). Patient satisfaction scores (85.68 v 86.7, p=0.96) were not significantly different with the team implementation.

Conclusion: The team-reporting approach resulted in improvement in waiting times and LOS. Patient satisfaction scores remained unchanged.

(Originally Submitted as a “Late-breaker”)

457 Prevalence of Methicillin-resistant Staphylococcus Aureus Among Hospitalized Pneumonia Patients in the United States
Anusha Krishnadasan, Gregory J Moran, and David A Talan
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Background: Methicillin-resistant Staphylococcus aureus (MRSA) has become a common cause of skin and soft tissue infections in the United States. Recent case series describe severe community-acquired pneumonia (CAP) caused by MRSA.

Objectives: The objective of this study was to determine the proportion of CAP caused by MRSA among adult patients presenting to emergency departments and admitted to the hospital, and to identify factors associated with MRSA as compared with other etiologies.

Methods: We prospectively enrolled adult patients hospitalized with CAP from 12 university-affiliated emergency departments during the winter–spring seasons of 2006 and 2007. Clinical information was collected on admission, and culture results were obtained when available. Factors associated with MRSA etiology were assessed. Available S. aureus isolates were characterized by antimicrobial susceptibility testing, pulsed-field gel electrophoresis, and detection of toxin genes.

Results: Of 627 patients, 595 (95%) had respiratory (50%) and/or blood cultures (92%) performed. Of cultured patients, a pathogen was identified in 102 (17%). MRSA was identified as the pneumonia etiology in approximately 2% (range by site, 0% to 5%) of all case-patients and in 5% of case-patients admitted to the ICU. Two (14%) MRSA pneumonia patients died. All nine MRSA isolates tested were pulsed-field type USA300. Although no reliable predictors of MRSA etiology were found, features associated with MRSA isolation included patient history of MRSA, admission to a nursing home in the previous year, close contact with someone with a skin infection in the previous month, being comatose, being intubated, requiring pressors, dying in the emergency department, and multiple infilrates and cavities on chest radiograph.

Conclusion: MRSA remains an uncommon cause of CAP in many areas of the United States.

458 Use of the Absolute Lymphocyte Count and CD4 Relationship to Improve TMP-SMX Usage in HIV+ Emergency Department Patients with Pneumonia
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Background: The absolute lymphocyte count (ALC) may predict a low CD4 count in admitted emergency department (ED) HIV+ patients.

Objectives: We sought to 1) validate the predictive ability between ALC and CD4 count in HIV+ ED patients admitted with pneumonia and 2) determine if this relationship could improve trimethoprim-sulfamethoxazole (TMP-SMX) use among HIV+ ED patients with pneumonia compared with standard care.

Methods: Retrospective multicenter study of HIV+ patients presenting to, and admitted through, one of three urban EDs with an ICD-9 diagnosis of acute bacterial pneumonia. Included patients needed an ALC measured in the ED and CD4 count measured ≤24 hours from the ALC. Strength of association of back-translated geometric means and confidence intervals (CI) of CD4 and ALC levels was assessed using a Spearman correlation coefficient. AUROC using the Wilcoxon method and a decision plot analysis were used to calculate the sensitivity, specificity, and the positive and negative likelihood ratios were used to identify pre-specified optimal clinical thresholds. Our primary outcome was to determine if an ALC threshold of 1700 would improve TMP-SMX administration when compared with standard care. The primary outcome was evaluated using a McNemar test for proportions in paired, non-parametric populations.

Results: Five hundred and forty-four patients were included. The geometric means and 95% CIs for CD4 and ALC were 112 (99–127) and 1161 (1097–1228), respectively. The Spearman correlation between ALC and CD4 was r=0.58 (95% CI 0.52–0.63, p<0.01). AUROC was 0.77 (0.73–0.81). An ALC of 1700 cells/mm3 was 82% (77–86) sensitive and 54% (48–61) specific for a CD4<200 cells/mm3. Standard practice was 22% sensitive and 86% specific. An ALC of 1700 would have led to a four-fold increase (22% to 82%) in those with a CD4<200 being administered TMP-SMX with a three-fold increase (6% to 20%) in those with a CD4>200 (p<0.01). This strategy would have yielded a net absolute increase in appropriate TMP-SMX prescribing of 18.6% (n=101 patients).

Conclusion: An ALC of 1700 cells/mm3 would improve appropriate TMP-SMX usage in HIV+ ED patients with acute bacterial infection.
pneumonia necessitating admission. An optimal ALC threshold strong enough to yield a point such that a CD4+200 cells/mm² could be rule out or ruled in without significant false positive or false negative rates could not be found.

Objectives: To compare the hospital length of stay of patients with pneumonia admitted from the emergency department (ED) who receive their first dose of antibiotics in four hours, four to six hours, and greater than 6 hours.

Methods: We conducted a retrospective chart review at a single academic ED on patients who received antibiotics and had a discharge diagnosis of pneumonia during a 17 month period. Using structured abstraction sheets, a trained reviewer abstracted data on hospital length of stay (defined by time between admission date and discharge date), time of arrival to first antibiotic dose, admission bed type, and other patient factors including severity of disease, age, HIV status, and health care associated pneumonia (HCAP) versus community acquired pneumonia (CAP) diagnosis.

Results: Five hundred and forty-one charts were available for abstraction. Four hundred and eighty-three (89%) were African American, 240 (44%) were female; the average age was 52 years old (SD 15), and 186 (34%) were HIV positive. Using a linear regression, the patients who received antibiotics within four hours stayed in the hospital for a longer duration than the patients whose antibiotics were delayed (>4 hours) (244 patients, median=4 days, average=5.8 days), but this was not significant (p = 0.7). Patients who received antibiotics within 4 to 6 hours stayed in the hospital for a longer duration than the patients who received antibiotics within 4 hours (146 patients, median=4 days, average=6.2 days), this was also not significant (p = 0.2). Patients who received antibiotics after six hours (152 patients) had a median length of hospitalization of three days and an average length of hospitalization of 4.9 days.

Conclusion: In patients with pneumonia admitted from the ED, time to first antibiotic dose does not correlate with length of stay when controlling for severity of disease, age, HIV status, and HCAP versus CAP diagnosis.
Conclusion: Compared to those who would meet the Joint Commission guidelines, the patients who did not receive antibiotics within six hours of presentation were likely to have tachycardia rates and O2 saturation levels that were closer to normal, thus contributing to diagnostic uncertainty. They were also likely to present at the time of day when the ED was most crowded and backed up.

**462 Utility of PCR Testing for Invasive Meningococcal and Pneumococcal Disease in a Paediatric Emergency Care Setting**
Sinéad McArdle, Ronan O’ Sullivan, and Sean Walsh
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**Background:** Polymerase chain reaction (PCR) plays an important role in yielding a definitive diagnosis of invasive meningococcal disease (IMD). Its utility in an emergency department (ED) setting is unclear.

**Objectives:** To identify: 1) patients who had PCR testing in our ED, 2) correlations between positive PCR and WCC, CRP, and blood cultures (BCs), 3) differences in clinical presentation between patients with positive and negative PCR.

**Methods:** Retrospective analysis of all meningococcal (mPCR) and pneumococcal (pPCR) PCRs over a 7.5 year period (January 2002 - June 2009) was undertaken. Patients’ WCC, CRP, and BCs were recorded. Case notes for positive patients from a one year period (June 2008 - June 2009) were reviewed. Matched controls were selected from the cohort of negative patients.

**Results:** 1,937 specimens were requested (1,804 EDTA and 133 blood cultures (BCs), 3) differences in clinical presentation between patients with positive and negative PCR.

**Conclusion:** We recommend inclusion of PCR testing in the ED setting.

**463 A New Serum Biomarker for Mild and Moderate Traumatic Brain Injury Is Associated With Intracranial Injuries and Neurosurgical Intervention**
Linda Papa1, Larry Lewis5, Jay L. Falk1, Salvatore Silvestri1, Philip Giordano1, Ming-Cheng Liu3, Jixiang Mo4, Jason Demery5, Gretchen Brophy6, Sameer Dravid1, Carolina Braga1, Frank Tortella2, Ronald L. Hayes6, and Kevin KW Wang5
1Orlando Regional Medical Center, Orlando, FL; 2University of Florida, Gainesville, FL; 3Virginia Commonwealth University, Richmond, VA; 4Banyan Biomarkers Inc, Alachua, FL; 5Banyan Biomarkers Inc, Alachua, FL; 6Veterans Hospital, Gainesville, FL; 7Virginia Commonwealth University, Richmond, VA; 8Walter Reed Army Institute of Research, Silver Spring, MD

**Background:** Ubiquitin C-terminal hydrolase-L1 (UCH-L1) is highly abundant and specific to neurons.

**Objectives:** This study compared levels of UCH-L1 from patients with mild and moderate traumatic brain injury (TBI) (MIMTBI) to uninjured and trauma controls and examined the relationship between levels with traumatic intracranial lesions on CT (+CT) and the need for neurosurgical intervention (NSI).

**Methods:** This prospective cohort study enrolled adult patients presenting to three tertiary care Level I trauma centers following MMTBI defined by blunt head trauma with loss of consciousness, amnesia, or disorientation and a GCS 9–15. Control groups included normal uninjured controls and trauma controls without TBI presenting to the emergency department (ED). Mild TBI was defined as GCS 13–15 with a -CT and moderate TBI as having a GCS 9–12 and/or a +CT. Blood samples were obtained in all patients within four hours of injury and measured by ELISA for UCH-L1 (ng/ml). The main outcomes were able to distinguish: 1) MMTBI from controls, 2) +CT from -CT, and 3) need for NSI defined by neurosurgery, ICP monitoring, or intubation for TBI. Data were expressed as means with 95%CI and as area under the ROC curve (AUC).

**Results:** Of the 297 patients enrolled, 98 were TBI patients (88 with GCS 13–15, and 10 with GCS 9–12) and 199 were controls (176 normal controls and 23 trauma controls). The mean age of TBIs was 39 years (range 18–89) with 64% males. There were 29 (30%) patients with a +CT and 14 (14%) who required NSI. Mean serum UCH-L1 levels were 0.073 (95%CI 0.064–0.081) in normal controls, 0.164 (0.113–0.215) in trauma controls, 0.788 (0.182–1.393) in mild TBI, and 1.283 (0.428–2.138) in moderate TBI (P<0.001). The AUC for distinguishing MMTBI from all controls was 0.83 (95%CI 0.80–0.90) and for distinguishing mild TBI from both controls was 0.82 (95%CI 0.76–0.88). Mean UCH-L1 levels in patients with -CT versus those with +CT were 0.613 (0.114–1.111) and 1.618 (0.645–2.590), respectively (P<0.001) and the AUC was 0.73 (95%CI 0.62–0.84). Patients not requiring NSI levels were 0.621 (0.193–1.049) versus 2.568 (0.724–4.413) for those needing NSI (P<0.001), and the AUC was 0.85 (95%CI 0.76–0.94).

**Conclusion:** UCH-L1 was able to distinguish MMTBI from both injured and uninjured controls and could discriminate mild TBI from both controls, as well. Initial ED levels of UCH-L1 had significant associations with having a +CT and with the need for NSI. Validation is ongoing.

**464 Posttraumatic Treatment With Thymosin Beta4 Reduces Lesion Volume and Improves Functional Outcome in Rats Following Experimental Traumatic Brain Injury**
Ye Xiong, Asim Mahmood, Yanlu Zhang, Yuling Meng, Zheng Gang Zhang, Daniel C Morris, and Michael Chopp
Henry Ford Health System, Detroit, MI

**Background:** Thymosin beta4 (T/4) is present in mammalian tissues including the nervous system. The major intracellular function of T/4 is G-actin-sequestration. Our recent study...
demonstrates that delayed (24 h post injury) T44 treatment improves neurological functional recovery in rats after traumatic brain injury (TBI) without reducing cortical lesion volume.

**Objectives:** This study was designed to investigate whether an early (6 h post injury) T44 treatment will alter lesion volume and improve functional recovery in rats after TBI.

**Methods:** Traumatic brain injury I was induced by controlled cortical impact over the left parietal cortex in young adult male Wistar rats under anesthesia. TBI rats were divided into the following groups: 1) saline group (n = 7); 2) low dose T44 group (6 mg/kg, ip, n = 8); and 3) high dose T44 group (30 mg/kg, ip, n = 8). T44 (RegeneRx Biopharmaceuticals Inc, Rockville, MD) or saline was administered intraperitoneally starting at 6 h and then repeated at 24h and 48 h post injury. Sensorimotor function and spatial learning were evaluated in all animals. Animals were euthanized 35 days after injury and their brains fixed for histological analyses to assess cortical lesion volume and hippocampal cell loss after T44 treatment.

**Results:** Compared to the saline treatment, the early T44 treatment significantly reduced cortical lesion volume (by 17% and 31% for the low and high dose group, respectively) and hippocampal cell loss as well as significantly improved sensorimotor functional recovery and spatial learning. The high dose T44 exhibited increased neuroprotection and functional recovery compared to the low dose treatment. These data for the first time demonstrate that early administration of T44 significantly reduces lesion volume and improves functional outcomes in rats with TBI.

**Conclusion:** Our data suggest that T44 is a potential therapy for TBI patients. These data warrant further investigation of the optimal dose and therapeutic window of T44 treatment for TBI and the associated underlying mechanisms.

**Physiologic Parameters in Goal-directed Therapy for Traumatic Brain Injury at a Level I Trauma Center**

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**Background:** 1.2 million cases of traumatic brain injury (TBI) are reported per year in the United States (U.S.), or 1/3 of U.S. trauma-related mortality. The Brain Trauma Foundation has published goal-directed therapy (GDT) guidelines to mitigate secondary brain injury from TBI. Provider utilization of GDT is variable.

**Objectives:** The relationship between the physiologic parameters defined in GDT and outcome is assessed in an urban emergency department (ED).

**Methods:** Retrospective chart review of ED encounters from 1/1/2009-1/1/2010 was conducted at a Level I trauma center (census >100,000 patients/year). Patients (n=210) with diagnosis of blunt head trauma and initial GCS 3-12 were identified via the Trauma Registry of the American College of Surgeons. Patients (n=210) with diagnosis of blunt head trauma and initial GCS 3-12 were identified via the Trauma Registry of the American College of Surgeons. Patients (n=210) with diagnosis of blunt head trauma and initial GCS 3-12 were identified via the Trauma Registry of the American College of Surgeons.

**Results:** Absence of hypoxia (80.5%) and/or hypotension (65.1%) was associated with an 84% and 52% decrease in the odds of death, respectively (ordinal regression analyses p<0.001, p<0.05). GCS score was inversely related to mortality (p=0.003). Lab abnormalities were not related to outcome. ED documentation of intracranial pressure was limited, precluding analysis.

**Conclusion:** Prior research has documented variability in management of TBI. In our sample of patients with moderate/severe TBI, patients whose physiological parameters met the recommended guidelines had improved patient outcome. Future research is needed to prospectively apply GDT for treatment of moderate/severe TBI in the ED setting.
increasing with the most common cause of death being head injury. This study used the National Trauma Data Bank (NTDB) to evaluate patients injured in skiing and snowboarding related accidents with specific attention to helmet use, injury severity, and death.

Objectives: To analyze the NTDB in order to determine the effect of helmet use on the Injury Severity Score (ISS), length of hospital stay, and survival to discharge of snow sport-related trauma presenting to the emergency department.

Methods: This was a retrospective cohort study. We extracted data from the NTDB years 2002–2008 for skiing and snowboarding related injury (ECODE 885.3, 884.9, 847, 885.4). From that data set, we compared the ISS, mortality, and ICD-9 diagnosis of those wearing helmets compared to those not wearing helmets. The odds ratio (OR) mortality by helmet use is presented unadjusted for covariates and then adjusted for significant covariates using a logistic model predicting mortality. To model the ISS score, it was log-transformed and then fit as the outcome in a multivariate regression model. The main predictor for both the logistic model of mortality and the regression model of ISS score was helmet status and possible covariates (for adjustment) included age, sex, race, and year of injury.

Results: Among those with documented helmet status, 2,075 (5.4%) used a helmet. The OR of mortality of those not wearing a helmet (compared to those wearing a helmet) was 6.1 (2.9–12.9). After adjusting for age, sex, race, and injury year variables (differences in wearing a helmet), those not wearing a helmet still had OR=3.2 (1.5–6.7). Those who did not wear a helmet had a significantly (p=0.013) higher estimated ISS score (log-transformed) even after adjusting for age, sex, race, and injury.

Conclusion: Helmet use in snow sports significantly reduces ISS and mortality. We recommend the medical community advocate for increased awareness and encourage helmet use at ski resorts.

The Prevalence of Immediate and Delayed Intracranial Hemorrhage in Patients With Pre-injury Anticoagulant Use and Head Trauma

Daniel K Nishijima1, Steven R Offerman2, Dustin Ballard3, Uli Chettipally4, David Vinson5, Adina Rauchwerger6, and James F. Holmes3

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Background: Patients on warfarin or clopidogrel are considered at increased risk for traumatic intracranial hemorrhage (tICH) following blunt head trauma. The rate of immediate and delayed tICH in these patients, however, is unknown.

Objectives: To determine the prevalence of immediate and delayed tICH in patients on clopidogrel and warfarin and the rate of delayed tICH in both groups is < 1%.

Methods: This is a prospective, observational, six center study evaluating the prevalence of immediate and delayed tICH in adult patients on warfarin or clopidogrel. Delayed tICH was defined as tICH on cranial CT scanning occurred within two weeks after an initial normal CT scan in the absence of repeat head trauma. Patients were enrolled in the emergency department (ED) and followed up after two weeks by phone or medical record review if hospitalized. Measured outcomes included immediate and delayed tICH. Data were analyzed with descriptive statistics.

Results: Eight hundred and seventy patients with a median age of 78 years (IQR 70–85) were enrolled (capture rate of 83%). Anticoagulant use included warfarin (622 patients, 71%) and clopidogrel (248 patients, 29%). Both warfarin and clopidogrel groups had similar patient characteristics (see the Table). Of patients receiving a CT in the ED, the rate of immediate tICH on CT was higher in patients on clopidogrel (29/231, 13%; 95% CI 8.6–18%) than on warfarin (27/591, 4.6%; 95% CI 3.0–6.6%). Delayed tICH was identified in 4/563 (0.71%; 95% CI 0.19–1.8%) patients on warfarin and 0/201 (0%; 95% CI 0–1.8%) patients on clopidogrel.

Conclusion: Patients on clopidogrel had a significantly higher rate of tICH on CT scan as compared to those on warfarin. Routine cranial CT scanning is indicated in patients on clopidogrel with blunt head trauma. The rate of delayed tICH was very low and only occurred in patients on warfarin. Discharging these patients from the ED after a normal CT scan is safe but appropriate instructions are required as delayed ICH may occur.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Warfarin</th>
<th>Clopidogrel</th>
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<tbody>
<tr>
<td>Age in years (median)</td>
<td>78 (IQR 70–85)</td>
<td>78 (IQR 68–84)</td>
</tr>
<tr>
<td>Male</td>
<td>48% (95% CI 44–52)</td>
<td>49% (95% CI 43–56)</td>
</tr>
<tr>
<td>Fall from standing</td>
<td>83% (95% CI 79–85)</td>
<td>83% (95% CI 78–88)</td>
</tr>
<tr>
<td>Loss of consciousness</td>
<td>16% (95% CI 14–20)</td>
<td>20% (95% CI 15–26)</td>
</tr>
<tr>
<td>GCS 15</td>
<td>87% (95% CI 84–90)</td>
<td>82% (95% CI 79–88)</td>
</tr>
<tr>
<td>TBI</td>
<td>31% (95% CI 27–34)</td>
<td>39% (95% CI 33–46)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>4.8% (95% CI 3.2–6.7)</td>
<td>3.5% (95% CI 1.6–6.5)</td>
</tr>
<tr>
<td>Trauma above clavicles</td>
<td>70% (95% CI 66–74)</td>
<td>75% (95% CI 69–80)</td>
</tr>
<tr>
<td>Cranial CT</td>
<td>95% (95% CI 93–97)</td>
<td>93% (95% CI 89–96)</td>
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Racial Outcome Inequalities for Moderate to Severe Traumatic Head Injuries

Catherine A Lynch, Debra Houry, and David W Wright
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Background: Racial minorities have been shown to have worse outcomes in trauma. Head injury is a major cause of death and disability for trauma patients.

Objectives: To evaluate racially based disparities in mortality and functional outcome for patients who sustain moderate to severe blunt traumatic brain injury (TBI), Glasgow Coma Scale (GCS) score <13.

Methods: Clinical data for moderate to severe head injury patients admitted during Jan. 2006- Jan. 2010 to a high volume (>100,000 ED visits/year) Level 1 trauma center were abstracted from the National Trauma Registry of the American College of Surgeons. Descriptive analyses and binary logistic regressions were performed using SPSS 18.0. Independent and confounding variables were compared with the mortality and functional independence measure (FIM) using chi-square analyses. Binary logistic regression was used to compare race (black, Hispanic, white), examining mortality and FIM (motor, feeding, and independence) for trauma patients.

Results: Of the total 179 moderate and severe TBI patients, 66.5%, had an average age of 43 (±SD 18). Forty percent were black, 50% were white, with an overall survival rate of 69%. The average GCS was 5.59 (±SD 3.093), RTS was 4.37 (±SD 1.942), ISS was 20.2 (±SD 13.6), and FIM score was 5.25 (±SD 7.52). Chi-square testing showed ISS, RTS, ED GCS scores, and black race (p=0.012) were all significantly associated with a worse mortality. Logistic regression found that ISS, RTS were significantly correlated with mortality. Black patients had a significantly higher mortality (p=0.036) with an OR of 3.93 (95% CI 1.34–10.93) compared to white patients, even when adjusting for ISS, RTS, ED and ED GCS. When comparing total versus partial FIM scoring for motor scores, black race approached significance (p=0.064). For both feeding and independence status on discharge, black (p=0.006, p=0.036) and Hispanic (p= 0.006, p=0.003) races correlated with a significantly worse outcome when adjusting for injury severity.

Conclusion: Black patients with moderate to severe TBI have worse mortality and functional independence regardless of the injury severity, and are more than three times more likely to die than white patients.
Background: Mild traumatic brain injury (mTBI) can lead to headache, (HA) and nausea/vomiting (N/V) to PCS. Knowledge of risk factors for PCS and clinical variables associated with later PCS would facilitate follow-up care.

Objectives: To ascertain the incidence and determine clinical variables associated with PCS following mTBI in children presenting to the emergency department (ED).

Methods: This is a subanalysis of children <19 years in an established mTBI ED cohort. mTBI was defined as a blow to the head with a Glasgow Coma Scale (GCS) score 13–15 and a history of loss of consciousness (LOC), alteration in mental status, and/or amnesia. Variables were collected prospectively. A three month follow-up call included the Rivermead Post Concussion Symptom Questionnaire (RPQ) and questions about post-mTBI functioning. PCS was defined as having ≥3 symptoms on the RPQ that were worse (score ≥2) than pre-mTBI. Chi-square statistics were used to compare groups. Multivariate logistic regression was used to examine the associations of age, sex, GCS, LOC, amnesia, headache, (HA) and nausea/vomiting (N/V) to PCS.

Results: Five hundred and eight of 652 children enrolled completed the follow-up. 152/508 (29.9%) of the children had PCS. Bivariate analysis showed that children with PCS were similar to those without PCS in terms of sex, race, mechanism, severity, arrival mode, prior TBI, GCS, amnesia, abnormal CT results, and receipt of PCS discharge instructions. However, they were older (p=14.4 vs 12.7 years) and significantly more likely (p-value <0.05) to have presented with LOC (61 vs 50%), HA (84 vs 66%), or N/V (44 vs 33%); and to have undergone brain CT scanning (63 vs 49%), been given analgesics in ED (67 vs 51%), been admitted (17 vs 8%), taken analgesics after discharge (67 vs 50%), had longer school absenteeism (7.9 vs 2.3 days), and be in process/intent on filing a lawsuit (20 vs 6%) than those without PCS. Multivariate analysis showed that age (OR 1.1, 95% CI: 1.0, 1.2) and HA (OR 2.2, 95% CI: 1.3, 3.6) were associated with PCS. Those with LOC were 50% more likely to develop PCS but this association was NS (OR 1.5, 95% CI: 0.32–0.89). An ondansetron prescription was not associated with a lower risk of return (OR 0.90, 95% CI 0.41–1.90).

Conclusion: Ondansetron use in the PED to alleviate symptoms in patients with head injury is becoming more frequent. The use of ondansetron in patients with a CT scan who are dispositioned home is safe, does not appear to mask any significant conditions, and significantly reduces return visits to the PED.

471 The Use of Ondansetron for Nausea and Vomiting After Head Injury and Its Effect on Return Rates

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Background: The use of ondansetron in children with vomiting following a closed head injury has not been well-studied. It has theoretical efficacy in alleviating symptoms of vomiting following head injury, although concern about masking more serious injury is a potential barrier to its use.

Objectives: To evaluate the use of ondansetron in patients with head injury and symptoms of vomiting in a cohort of discharged pediatric patients and its effect on return rates and potentially masking more serious injuries.

Methods: All visits to two tertiary care pediatric emergency departments (PEDs) from 2003–2010 with an ICD-9 diagnosis of closed head injury (with and without loss of consciousness) were evaluated retrospectively. Patients who were discharged home after a head CT are the primary cohort for study. Demographic (age, sex, race, insurance) and acuity variables (Emergency Services Index [ESI] level) of patients who received ondansetron were compared to those who did not. To control for differences in acuity and demographic variables, a logistic regression model was used to analyze ondansetron’s effects on the likelihood of return to the PED within 72 hrs for persistent symptoms.

Results: 7857 patients had a diagnosis of head injury, had a head CT performed, and were discharged home during the study period. 1505 (19.1%) of these patients were given ondansetron in the PED and 748 patients (9.5%) received a prescription for ondansetron at PED discharge. The use of ondansetron in the study group increased significantly over time from a rate of 4.7% in 2003 to 26.5% in 2010 (p for trend <0.001). Of those patients who did not receive ondansetron in the PED, 2.2% returned to the PED within 72 hrs, compared to 1.1% in the group who received ondansetron (p<0.001). All patients in both groups who returned to the PED had post-concussive symptoms; there were no alternative diagnoses. After controlling for differences in age, sex, race, insurance, and ESI level, being given ondansetron in the PED was associated with a lower risk of returning within 72hrs (OR 0.54, 95% CI 0.32–0.89). An ondansetron prescription was not associated with a lower risk of return (OR 0.90, 95% CI 0.41–1.90).

Conclusion: Ondansetron use in the PED to alleviate symptoms in patients with head injury is becoming more frequent. The use of ondansetron in patients with a CT scan who are dispositioned home is safe, does not appear to mask any significant conditions, and significantly reduces return visits to the PED.
Conclusion: Only about 4% of ED patients were admitted to CDUs. CDUs were independently associated with small, but significant reductions in median ED LOS overall and for low-acuity and non-admitted patients, and small reductions in hospital admission rates for moderate-acuity patients. We found no evidence of any increase in ED re-visit rates. These findings suggest small efficiency gains for the operation of the entire ED as a result of the presence of a CDU.

Objectives: To assess change(s) in time to provider, EDLOS, and LWBS after implementation of a novel triage and flow process.

Methods: Our Safety-Net ED operates in a modern 44-bed ED. In addition to standard beds, six semi-private cubicles and four private curtained areas were recently installed. Lower-acuity patients are triaged to these areas of the ED. As part of this improvement project we also implemented mini-registration, a provider at initial screening, and a treatment nurse for lower-acuity patients. We hypothesized that handling patients differently by likelihood of disposition (streaming) compared to standard practice (pooling) improves patient flow as measured by two operational outcomes: time to first treatment (TTFT) for likely admitted patients, and total length of stay (TLOS) for likely discharged patients. The use of a combination of analytical and simulation models shows that a streaming policy can improve ED performance and describes the system characteristics in which it is most likely to be effective.

Results: This model shows that streaming improves patient flow by up to 25%, but only in some situations. ED resources must be virtually (rather than physically) separated. Streaming is advantageous when there is: higher percentages of admitted patients, longer care times for admitted patients than discharged patients, lower relative weight assigned to TTFT compared to TLOS of admitted patients, higher day-to-day variation in the percentage of admitted patients, longer patient boarding time for admitted patients, and higher physician productivity. Streaming is further advantaged when physicians assigned to admit patients prioritize upstream (new) patients while physicians assigned to discharge patients prioritize downstream (old) patients. Patient flow improvement is a result of significantly improved TLOS for discharged patients, though there is a small degradation in TTFT for admitted patients.

Conclusion: Streaming in the ED by prioritizing patients based on likelihood of disposition improves flow as measured by TTFT and TLOS. Operational characteristics of both the system and the intervention are important determinants of success.
when IRAZ was in place against equal lengths of time immediately prior (IP) to IRAZ implementation and during the same period one year earlier (1YE). All registered patients were eligible. Confounding variables including total volume and admission rates were incorporated into the analysis: nursing staffing levels were noted as well. Primary outcomes were length of stay (LOS), unplanned revisits, and left without being seen (LWBS).

**Results:** 29.3% of all CTAS 3 and 4 patients (n = 25,090) were treated in IRAZ during the intervention period. CTAS 3 and 4 patients who presented to the ED while IRAZ was operational experienced a mean LOS of 3.95 hours while the IP and 1YE patients experienced LOS of 4.47 and 4.27 hours respectively, (P < 0.0001 for both comparisons). The improvements in throughput yielded a reduction in LWBS (8.5% during IRAZ; 11.1% in IP and 11.6% in 1YE time periods; P <0.0001). Unplanned revisits within 72 hours were unaffected by IRAZ: 7.4% vs. 7.3% and 7.6% for IP and 1YE, respectively; P = NS. Potential confounders did not influence the observed differences, and overall volume of CTAS 3 and 4 patients actually increased during IRAZ as did nurse staffing by 5.6%.

**Conclusion:** Intake / rapid assessment zone implementation has led to significant improvements in throughput without compromising quality of care for CTAS 3 and 4 patients. The IRAZ model merits study in other centers to determine if its impact is institution-specific.

**476 Impact of the Four Hour Throughput Target on Time Patients Spend in the Emergency Department**

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**Background:** Since 2005, 98% of emergency department (ED) patients in England must be treated and discharged or admitted to a hospital bed within four hours of arrival. While most hospitals are now within range of this target, it is unknown if the target benefits all patients equally.

**Objectives:** To evaluate the target’s effect on time patients spend in UK EDs, particularly the elderly and those admitted.

**Methods:** We performed a retrospective time series analysis of ED patient visits throughput before, during, and after implementation of the target. Data were obtained from 15 purposively sampled Acute Hospital Trusts with different performances on the target. We included all patient visits during May and June of 2003–2006. Total time in the ED and time to clinician were compared across years, for admitted vs. discharged patients, and young vs. old patients, adjusting for hospital clustering.

**Results:** 735,590 ED visits were analyzed. The proportion of patients seen and treated within four hours improved from 83.9% to 96.3%, although median ED stay increased by 8 minutes. There was a ‘spike’ in the proportion of patients leaving the ED during the last 20 minutes before four hours, which increased from 4.7% of all patients in 2003 to 8.4% in 2006. Admitted patients were significantly more likely than discharges to leave the ED in the last 20 minutes and the relative likelihood increased each year after 2003: IRR for admission 1.04 (95% CI 0.78 to 1.39), 1.39 (1.05, 1.82), and 1.55 (1.19, 2.20). An increasing proportion of elderly patients were found within the spike each year when compared with younger patients (in 2003 7.4% vs. 4.1%; in 2006 17.3% vs. 6.3%).

**Conclusion:** While introduction of a time target reduced the proportion of ED patients staying more than 4 hours, median time in department is unchanged. The growing “spike” in activity just before the deadline implies system difficulties that affect the most vulnerable patients.
Table I: Demographic Factors, Number, and Triage Level Rate of Visiting Patients of Each Physician

<table>
<thead>
<tr>
<th>Physician</th>
<th>½</th>
<th>3/4</th>
<th>5/6</th>
<th>7/8</th>
<th>9/10</th>
<th>11/12</th>
<th>13/14</th>
<th>15/16</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Patient number</td>
<td>1878/748</td>
<td>883/1996</td>
<td>1644/980</td>
<td>979/1273</td>
<td>1394/1067</td>
<td>816/910</td>
<td>1071/1291</td>
<td>1136/887</td>
<td></td>
</tr>
<tr>
<td>Male (%)</td>
<td>50.19/50.87</td>
<td>51.45/51.27</td>
<td>52.00/52.87</td>
<td>51.83/54.20</td>
<td>51.76/51.62</td>
<td>50.37/52.00</td>
<td>50.67/51.49</td>
<td>0.8814</td>
<td></td>
</tr>
<tr>
<td>Triage level 1 (%)</td>
<td>38.25/38.71</td>
<td>37.83/38.42</td>
<td>38.36/38.95</td>
<td>38.07/39.56</td>
<td>38.83/39.45</td>
<td>39.06/39.78</td>
<td>39.25/40.04</td>
<td>0.2873</td>
<td></td>
</tr>
<tr>
<td>Triage level 2 (%)</td>
<td>41.50/42.00</td>
<td>41.29/41.87</td>
<td>41.40/42.09</td>
<td>41.13/42.78</td>
<td>41.33/42.12</td>
<td>41.23/42.09</td>
<td>41.50/42.25</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Triage level 4 (%)</td>
<td>6.00/6.25</td>
<td>6.25/6.50</td>
<td>6.25/6.50</td>
<td>6.25/6.50</td>
<td>6.25/6.50</td>
<td>6.25/6.50</td>
<td>6.25/6.50</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>

Results: Results: The results were regarded as statistically significant. Analysis was performed using the Cochran-Metel-Haenszel test. A p-value < 0.001 was considered statistically significant. Discharge rates were compared using ANOVA and chi-square tests. The statistical significance of differences between different age groups was assessed using the Cochran-Metel-Haenszel test. A p-value < 0.001 was regarded as statistically significant.

Conclusion: Our findings indicate that admission/discharge decision-making was not the same between EPs. We also found that the senior EPs (with more than 10 years of working experience) had higher discharge rates in triage level 1 and 2, 3 patients and overall patients. There is no difference in statistical significance when Group B was compared to Group C. There is also no statistical difference in 72 hour revisit rate when any two groups were compared.

Table II. Discharged Rate in Each Triage Level and 72 Revisit Rate of Each Physician

<table>
<thead>
<tr>
<th>Triage level</th>
<th>1 (%)</th>
<th>2 (%)</th>
<th>3 (%)</th>
<th>4 (%)</th>
<th>72 hour revisit rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.05/10.50</td>
<td>38.38/38.43</td>
<td>42.68/43.00</td>
<td>46.25/46.78</td>
<td>2.63/1.33</td>
</tr>
<tr>
<td>2</td>
<td>10.05/10.50</td>
<td>38.38/38.43</td>
<td>42.68/43.00</td>
<td>46.25/46.78</td>
<td>2.63/1.33</td>
</tr>
<tr>
<td>3</td>
<td>10.05/10.50</td>
<td>38.38/38.43</td>
<td>42.68/43.00</td>
<td>46.25/46.78</td>
<td>2.63/1.33</td>
</tr>
</tbody>
</table>

Table III. Comparison of Odds Ratios within Three Groups According to Seniority

<table>
<thead>
<tr>
<th>Triage Level</th>
<th>Odds ratio (95% confidence limits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.6250 (1.2861~2.0933)</td>
</tr>
<tr>
<td>2</td>
<td>1.3325 (1.2343~1.4386)</td>
</tr>
<tr>
<td>3</td>
<td>1.2004 (0.9273~1.5000)</td>
</tr>
</tbody>
</table>

Conclusion: Our findings indicate that admission/discharge decision-making was not the same between EPs. We also found that the senior EPs (with more than 10 years of working experience) had higher discharge rates in triage level 1 and 2, 3 patients and overall patients. There is no difference in statistical significance when Group B was compared to Group C. There is also no statistical difference in 72 hour revisit rate when any two groups were compared.

Future directions: Further research is needed to explore the role of seniority in decision-making.
and John T. Nagurney1
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2Johns Hopkins School of Medicine, Baltimore, MD

Background: Little information exists on how accurately emergency physicians (EPs) predict acute coronary syndrome (ACS). Objectives: To determine if EPs can accurately predict ACS in emergency department (ED) patients.

Methods: We analyzed data from Romicat I, a prospective observational study in the ED of an urban AMC. Subjects were consecutive patients admitted for ROMI protocols. Their ED providers gave predictions from 0.1 to 100% of the probability of ACS after performing an initial evaluation. Predictions were grouped into Goldman risk categories (very low <1%, low 1–7%, moderate 8–20%, high ≥21%). Test characteristics (TCs) were calculated for two definitions of a “negative” test: probability ≤7% and probability ≤20%. ACS was determined by an outcomes committee using AHA/ACC guidelines. Chi-square tests were used to compare the proportion of ACS among different prediction groups.

Conclusion: While EPs predict ACS better than by chance, their predictions at published cutoffs lack both sensitivity and specificity, and confer negative LRs too high to safely discharge patients home from the ED. More research needs to be done to understand the determinants of EPs’ predictions.

481 The Moratorium on Ambulance Diversion in Western Massachusetts
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1Baystate Medical Center, Springfield, MA; 
2Franklin Medical Center, Greenfield, MA; 
3Cooley-Dickinson Hospital, Northampton, MA; 
4Mercy Medical Center, Springfield, MA; 
5Mary Lane Hospital, Ware, MA; 
6Noble Hospital, Westfield, MA; 
7Holyoke Medical Center, Holyoke, MA

Background: The State of Massachusetts (MA) instituted a moratorium on ambulance diversion (no diversion) on 1/1/09 to ensure timely access to emergency care.

Objectives: To compare changes in key process measures pre and post no diversion in Western MA. Participants included six community emergency departments (EDs) (17 – 74,000 annual visits) and a Level 1 trauma center (112,000 annual visits). Based on 2008 annual diversion hours, two EDs were considered “high” diversion (HD) (562 hours) and five were “low” diversion (LD) (≤260 hours).

Methods: Ambulance arrivals for 2008 and 2009 were measured for all EDs. The following mean monthly measures were collected from each ED: 1) total volume, 2) numbers of admissions, 3) elopements, and 4) ED length of stay (LOS) for all, admitted, and discharged patients. To adjust for seasonal variation, measures were collected for three 3-month periods related to no diversion: P1-year prior (Jan-Mar 2008); P2 - just prior (Oct-Dec 2008); P3 - after (Jan-Mar 2009). The mean percent change over the period was estimated by the slopes of change. Linear mixed models were used to conduct within-hospital measurement over time, estimate changes in outcomes during each 3-month period, and compare slopes of change across periods. Discontinuous shifts in measures at the point of implementation were assessed. Separate models were run for each outcome for all, HD, and LD EDs using Stata v.11.1. Time in months was centered at 1/1/09. Results are presented as change per month in number and percent from the mean with 95% CIs.

480 Enhancing Teamwork Skills Among Health Care Providers in the Emergency Department: Development and Assessment of the Effectiveness of a Team Training Educational Program
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1Mayo Clinic, Rochester, MN; 
2American Institutes for Research, Washington, DC; 
3ENA, Chicago, IL

Background: Health care team training is at the forefront of a movement to reduce medical errors and improve patient safety, placing emphasis on team behaviors rather than medical/technical knowledge and procedural skills.

Objectives: This study assesses the effect of interdisciplinary team training followed by an intensive one-year coaching sustain- ment program on observed teamwork behaviors and attitudes in an academic emergency department (ED).

Methods: A pre/posttest study design assessed results over a 1.5-year study period. A behavior rating scale based on the Team STEPPS Performance Observation Tool was calibrated and used by the same two teamwork/human factors experts pre/post-training to measure teamwork behaviors. A third external observer contributed to the final assessment. A pre/post-survey of teamwork attitudes and patient safety practices was developed from publicly available, validated measures. Based on needs assessment from these initial assessments, an interdisciplinary 4-hour training program was designed and conducted for all ED staff over a two month period. All ED staff were invited to attend extra training sessions on coaching techniques. Shifts with no clinical responsi- bilities were scheduled to facilitate active peer coaching for rein- forcement of these skills.

Results: Initial mean survey scores ranged from 2.90- 4.37 while initial observation scores ranged from 1.52-2.48 (scale 1 = poor to 5 = exceptional). All 31 observed teamwork behaviors improved significantly post-intervention, with a mean improvement of 0.94, p<0.05. Specific behaviors showing the greatest improvement were “effectively advocating for the patient”, and “ensuring a team shared mental model”, with mean differences of 1.45 (p<0.01) and 1.28 (p<0.01), respectively. Staff perceptions of team- work captured via survey improved less dramatically with statistically signifi- cant improvement on only 6 of 16 scales measured.

Conclusion: Explicit teamwork training with active coaching effectively increased observable teamwork behaviors. Present sur- veys assessment tools for teamwork attitudes and patient safety culture were unable to detect the degree of changes in teamwork beha- viors detectable with observation tools. Staff perceptions of team- work may not reflect the true state of teamwork behavior prior to remediation.
Results: Between 2008 and 2009, ambulance arrivals increased by 3065 in all and 2552 (83%) in HD EDs. Discontinuous shifts in monthly measures were not found. In HD EDs, volume and elopements showed differences in slopes between P1 and P3 as well as P2 and P3. Volume per month changed: P1 –31.8 (–7%); –22.9, 8.9). P2 –152.3 (–34.6%); –50.5, –18.7), and P3 60.8 (19.4%: 3.5, 35.5). No statistically significant changes were found for other measures between P3 and P1, as well as P3 and P2.

Conclusion: High diversion emergency departments received the majority of the increase in ambulance arrivals. No diversion was associated with increases in total volume and number of elopements in HD EDs. In these two EDs with 74–114,000 annual visits, the clinical effect of no diversion was minimal.

482 Characteristics Associated With Emergency Department Admission Rates
Beth Israel Deaconess Medical Center, Boston, MA

Background: As efforts to control health care costs expand, it is likely that hospital admissions from the emergency department (ED) will be increasingly scrutinized. Therefore, factors associated with ED admission rates need to be identified and controlled for in order for the comparison of adjusted admission rates to be valid.

Objectives: To identify the patient, physician, and environment of care factors that are associated with ED admission.

Methods: All ED visits to a tertiary care university hospital from July 2009 to June 2010 were reviewed. Only first (index) visit was included. Visits were excluded if the patient had been discharged from the hospital within one week of ED arrival. Three domains of potential factors associated with ED admission included patient-level clinical and demographic characteristics, physician-level demographic and professional characteristics, and environment-of-care variables. Fifty percent of the ED visits were randomly selected as a derivation set. All potential factors were evaluated using univariable analysis and stepwise regression (within each domain) in the derivation set. The resulting final regression model was validated on the second data set.

Results: Of 54,658 ED visits, 35,494 unique visits were included in the analysis. The characteristics that were significantly associated with ED admission are shown in Figure 1. The C statistic of the receiver operating characteristic curve was 0.858 in the derivation set as well as in the validation set. The C statistic of patient-level characteristics alone was 0.829, accounting for most of the full model’s predictive power. The most significant factors are mode of transportation (p < 0.001), insurance type (p < 0.001), and triage acuity (p < 0.001).

Conclusion: A regression model predicting the probability of admission was derived and validated for a general ED population. This model can be used to compare admissions rates between institutions.

483 Utilizing an Artificial Neural Network to Predict Emergency Department Volume
Robert Fraser1, Nicholas Caputo1, Jordana Haber1, Robert Chin1, Marie Menke2, and Nathan Menke1
1Lincoln Medical and Mental Health Center, Bronx, NY; 2Albert Einstein College of Medicine, Bronx, NY

Background: Overcrowding in the emergency department (ED) is a growing problem across the United States. The ability to predict ED volume could help to maximize resource utilization and improve patient care. To date, models have been proposed to predict ED volume with no success. An artificial neural network (ANN) is composed of a large number of interconnected processing elements working together to solve specific problems. An ANN is an adaptive system that changes its structure based on the information that flows through the network during the learning
process. Ultimately, meaning is derived from complicated or imprecise data. Prediction models arise from computationally derived patterns that are too complex for humans to appreciate independently.

Objectives: To design an ANN that may be used to predict ED volume.

Methods: We conducted a retrospective review of patient registry data from February 4, 2007 to December 31, 2009 from an inner city, tertiary care hospital. We harvested data regarding weather, days of week, air quality, and special events in order to train the ANN. The ANN belongs to a class of neural networks called multi-layer perceptrons. The ANN is composed of 37 input neurons, 22 hidden neurons, and one output neuron. The training method is a supervised backpropagation algorithm that uses mean-squared error to minimize the average squared error between the ANN’s output and the number of ED visits over all the example pairs.

Results: Figure 1 provides a scatter plot of the ED predicted visits vs. the actual ED visits including a line of best fit calculated using ordinary least squares regression. A correlation coefficient of 0.9752 is obtained. Table 1 demonstrates the percentage of time that the ANN was within a given number of visits.

Conclusion: The results of this study show that an ANN is an effective tool which may be used to predict ED volume. The scatterplot demonstrates that the ANN is least predictive at the extreme ends of the spectrum, suggesting that the ANN may be missing important variables. A properly calibrated ANN will allow ED to staff their units more appropriately in an effort to reduce patient wait times, decrease ED physician burnout rates, and increase the caregivers’ ability to provide quality patient care. The next step requires prospective validation of the ANN’s ability to predict patient volume.

Table 1: Percent of Time That the ANN Predicted the Actual Number of +/- Given Number of Visits

<table>
<thead>
<tr>
<th>Visits</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 1 visit</td>
<td>53</td>
</tr>
<tr>
<td>Within 2 visits</td>
<td>66</td>
</tr>
<tr>
<td>Within 5 visits</td>
<td>83</td>
</tr>
<tr>
<td>Within 10 visits</td>
<td>91</td>
</tr>
<tr>
<td>Within 20 visits</td>
<td>95</td>
</tr>
</tbody>
</table>

484 The Association Between EMS Field Performance Assessed by High Fidelity Simulation and the Cognitive Knowledge of Practicing Paramedics

Jonathan Studnek1, Antonio R Fernandez2, Brian Shimberg3, Melissa Garifo3, Michelle Correll1, and Tom Blackwell1
1Carolinas Medical Center, Charlotte, NC; 2National Registry of EMTs, Columbus, OH; 3Mecklenburg EMS Agency, Charlotte, NC

Background: It has been questioned whether knowledge demonstrated on a cognitive exam is associated with emergency medical services (EMS) field performance.

Objectives: The study objective was to assess the association between practicing paramedics’ performance on a validated cognitive exam and performance on a simulated EMS response using a high fidelity simulator.

Methods: This was an observational study of paramedics from a single-tiered, urban, advanced life support EMS agency. A high-fidelity simulated response to a medical emergency on environmentally realistic sound stages and the cognitive portion of the national paramedic certification exam were assessed as pass or fail. Participants were randomly assigned to one of six simulations designed by the agency’s educational staff, medical director, and representatives from the National Registry of EMTs to be equivalently difficult. Simulations were pilot-tested to assess content and face validity. Individuals were classified as failing a simulation scenario if their score was one standard deviation below the population mean.

Results: There were 107 paramedics who participated in the study. Simulation scores were normally distributed with 92 (86.0%) participants receiving a passing score for the simulation and 77 (72.0%) passing the cognitive exam. When comparing cognitive exam results to simulation performance, there was a statistically significant association between passing the cognitive exam and passing the simulation (chi-square p-value = 0.02). There were 70 (65.4%) individuals who passed both the simulation and the cognitive exam. Eight (7.5%) individuals failed the simulation and the cognitive exam while 22 (20.6%) passed the simulation but failed the cognitive exam, and seven (6.5%) failed the simulation but passed the cognitive exam.

Conclusion: This is the first study, within the EMS profession, that has simultaneously assessed cognitive knowledge and simulated field performance. Use of these measurement techniques allowed for the assessment and comparison of field performance and cognitive knowledge. Results from this study suggest that, among practicing paramedics, performance on the national paramedic certification exam may be predictive of paramedic field performance. Future study should use a larger, more diverse sample to further assess this relationship.

485 The Effectiveness of High Fidelity Patient Simulator Cases for EMT/EMT-P Continuing Education

Andrew Juergens II1, Margaret Strecker-McGraw1, David Morgan2, and Timothy Stallard2
1Scott and White Hospital, Temple, TX; 2Texas A&M Health Science Center, Temple, TX

Background: There are no published reports of the long-term effectiveness of high-fidelity simulation for the continuing education of prehospital providers. The Society for Academic Emergency Medicine (SAEM) Simulation Interest Group has developed cases for emergency medicine (EM) physician education which may be modified for prehospital providers.

Objectives: Our goal was to determine if high-fidelity simulation training of prehospital providers continues to be effective eight months later.

Methods: This was a prospective, longitudinal, observational study. Four simulation scenarios were selected from the SAEM Simulation Case Library (emedu.org/sim): myocardial infarction (MI), burn, croup, and eclampsia. They were modified by removing laboratory results, radiographs, and emergency department (ED) actions. Each case had three to seven critical actions which were timed. The scenarios ended at 10 minutes, to reflect an estimated amount of time providers would spend with patients in the field. Teams of three to four EMS providers worked together on each scenario. Subjects were blinded to which parameters would be timed. Eight months later, the scenarios were repeated with slight modifications to the patient presentation, but the critical actions remained the same. The critical actions performed in less than 10 minutes were compared between the two sessions.

Results: There were 609 actions measured in the 8-month period. For three critical actions, the fraction of actions performed increased after 8 months: MI (90.0% to 97.1%), burn (89.5% to 91.7%), and croup (84.9% to 92.3%). Only the MI case had a statistically significant increase (p = 0.037). For eclampsia, the fraction decreased from 97.2% to 91.0%, but this was not statistically significant (p = 0.155). After eight months, the fraction of critical actions for each of the four cases was greater than 90%.

Conclusion: SAEM high-fidelity patient simulator cases may be used effectively for the continuing education of prehospital providers. Most EMS providers had similar or improved time of critical actions when tested eight months later. Additional studies are needed to determine the basis for this tendency toward improved critical action time long after simulation training.
Profile of Pediatric Resuscitation Skills Demonstrated by Pediatric and Emergency Medicine Residents in a Simulated Setting

Barbara M Walsh and Mariann Manno
University of Massachusetts Medical School, Worcester, MA

Background: Most pediatric (PEDS) and emergency medicine (EM) residency programs use pediatric advance life support (PALS) as a principle way for trainees to learn pediatric resuscitation. However, true emergencies in PEDS are rare, so practice with and retention of resuscitation skills is generally poor. High-fidelity medical simulation (HFMS) is effective in enhancing residents’ performance in emergency situations.

Objectives: 1) Profile the resuscitation skills demonstrated by teams of residents within cognitive (CS), technical (TS), and behavioral (BS) domains. 2) Use the data on identified deficits to guide the use of frequent HFMS sessions and improve competencies.

Methods: Teams of equivalent mix (PL1-PL3) levels of PEDS or EM residents participated in 48 simulations. Two PALS-based scenarios, representative of common pediatric emergencies, were used. A series of critical actions (CAs) were identified for each. Cases were time-stamp videotaped. Each tape was scored by faculty to establish the successful completion of CAs. One point was assigned to each successful completion. Each simulation received a final score based on the number of CAs successfully completed. CAs were grouped into three categories (CS, TS, and BS), which were analyzed separately. The order and times of interventions was analyzed for Case 2.

Results: Case 1 (myocarditis) was simulated 22 times: 18 PEDS, 4 EM. The overall CA score was 78%. Scores for domains were: CS 74%, TS 92%, and BS 64%. Case 2 (bronchiolitis) was simulated 26 times: 11 PEDS, 15 EM. The overall CA score was 81%. Scores for domains were: CS 89%, TS 88%, and BS 74% (chart). The timing of events was analyzed for Case 2. Eighty-eight percent of teams identified the need to start CPR and give epinephrine (EPI). Thirty-eight percent performed CPR at 10 seconds of HR < 60 (mean time to CPR = 45 sec). Seven percent gave EPI within 30 sec of a HR < 60 (mean time to IV EPI =99 sec). Sixty-four percent of the EM teams pushed atropine before EPI. PEDS teams never used atropine (see the Table).

Conclusion: Despite PALS certification, PEDS and EM residents demonstrated gaps in pediatric resuscitation skills, particularly nontechnical domains. We conclude that PALS and clinical experience is insufficient in preparing residents to perform well in pediatric emergencies. HFMS, repeated practice of scenarios aligned with PALS, and emphasis on leadership and complex decision-making are strategies that could improve resuscitation skills among residents.

Learning ACLS: High-fidelity Simulation Vs Traditional Low-fidelity Simulation

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Hennepin County Medical Center, Minneapolis, MN

Background: This study compares high-fidelity (HF) simulation for ACLS teaching to the traditional low-fidelity (LF) method.

Objectives: We hypothesized that emergency medicine (EM) residents learn advanced cardiac life support (ACLS) more effectively with HF simulation than with traditional LF teaching.

Methods: This was a randomized, blinded, controlled study of EM residents learning ACLS. Fifty percent of the participants had one hour of ACLS training using HF simulation, and 50% received ACLS training in a standard eight hour LF course. Evaluation occurred one day post training with an HF mock code, and a blinded third party observer using a critical actions checklist. Participants in the LF group had training in the use of HF simulation using a trauma scenario. Learners rated their comfort level and perceived competency after training on a 10-point scale, and completed a pre- and post-test. Data were analyzed using Wilcoxon rank sum and chi-square tests.

Results: Thirteen subjects were enrolled, six in the HF group and seven in the LF group. The HF group spent one hour of educational time learning the assessment and treatment of ventricular tachycardia, ventricular fibrillation, pulseless electrical activity, and asystole. The LF group spent eight total hours of educational time on these topics. We were unable to find a difference in perceived comfort (p=0.72) and competency (p=0.60) between the HF group (medians 5, 5) and the LF group (medians 5, 5). We were unable to find a difference in the pre-test scores (medians HF 85, LF 80, p=0.24) or post-test scores (medians HF 81, LF 85, p=0.82). Both groups performed 75% of the critical actions. Two critical actions were performed at significantly different rates between the two groups. One hundred percent of the HF group did so (p=0.72) and competency (p=0.60) between the HF group (medians 5, 5) and the LF group (medians 5, 5). We were unable to find a difference in the pre-test scores (medians HF 85, LF 80, p=0.24) or post-test scores (medians HF 81, LF 85, p=0.82). Both groups performed 75% of the critical actions. Two critical actions were performed at significantly different rates between the two groups. One hundred percent of the HF group allowed for circulation of medications before rechecking pulse, while only 29% did so in the LF group (p=0.02). One hundred percent of the LF group performed CPR at the proper rate of compression, while only 33% of the HF group did so (p=0.04).

Conclusion: The HF group required less training time than the LF group to achieve similar results. Using high fidelity simulation to teach ACLS to EM residents may be more efficient than the traditional LF method. HF simulation may be more effective at teaching cognitive thought processes, while LF simulation may be more effective at teaching procedures.
Objectives: To evaluate the resuscitation proficiency of practicing PEM physicians using high-fidelity medical simulation as an assessment tool.

Methods: This is a prospective observational study involving PEM physicians employed in a tertiary care children’s hospital emergency department. Twenty-four PEM physicians participated. They completed a demographic survey documenting their resuscitation experience. They were then observed as they led a standardized mock code scenario. A high-fidelity simulator was used for the code. Each physician’s performance of predetermined critical actions was recorded on a competency checklist by a single observer. Time to completion of selected interventions was recorded.

Results: Seventy percent of participants reported more than five years of experience. The median interval from most recent PALS course participation (as instructor or student) was 0.5 years. Fifty percent had conducted ≥ 6 resuscitations or mock codes in the previous year and 80% felt “reasonably” to “very confident” in managing resuscitations. Seventy-nine percent of participants selected an appropriate O₂ delivery device, 83% appropriately initiated PPV, 15% placed a NGT following intubation, 91% chose an appropriately sized ETT, 75% confirmed endotracheal tube placement with a carbon dioxide detector, 84% recognized ventricular fibrillation, 88% appropriately started chest compressions, 79% confirmed the presence of a pulse with compressions, and 36% did a pulse check one minute after the shock. Comparison of PEM Trained with Pediatricians

Comparison of PEM Trained with Pediatricians

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Conclusion: Resuscitation proficiency varied among participants in our sample. Pediatric emergency departments may be interested in periodically assessing physician resuscitation competency, perhaps using high-fidelity simulation.

Objectives: We hypothesized that an in-situ trauma simulation (ISTS) program (simulating traumas in the trauma bay with all members of the trauma team) can improve teamwork and communication (T&C) in the clinical setting.

Methods: We measured T&C using the previously validated clinical teamwork scale (CTS) (Guise JM, 2008). Our observers were three TNCC-certified RNs trained on the CTS by observing simulated and actual trauma cases with each case followed by a discussion of CTS scores with two certified ATLS instructors/emergency department (ED) attending physicians in a Level I trauma center. Cases were scored in four phases for the study: 1) Pre-intervention phase (baseline). 2) Didactic-only intervention phase: following a lecture series on T&C in trauma care. 3) ISTS phase: trauma cases scored during period when weekly ISTSs were performed (see Figure 1). 4) Decay phase: Observation following the discontinuation of the ISTSs.

Results: Data were collected on 39 cases. Multi-rater agreement was assessed with Krippendorf’s α-coefficient; agreement was excellent. We used analysis of variance (SAS, PROC MIXED) to test the hypothesis that the mean scores observed during the ISTS phase were different compared to the other phases using a two-tailed Type I error rate of 5% to determine statistical significance. The mean score for all 14 measures on the CTS improved during the simulation phase. The following six achieved statistical significance: transparent thinking (p=0.042), directed communication (p=0.035), overall decision-making (p=0.0465), prioritization (p=0.0384), role clarity (p=0.0444), and performance as a leader/helper (p=0.0496) (see Figure 2). All of these measures showed a regression towards baseline values after the ISTS program was stopped.

Conclusion: This study shows that T&C in the clinical setting can be improved through an ISTS program, but T&C scores appeared to regress towards baseline after ISTS stopped.

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Figure 1: An In-situ Trauma Simulation

Figure 2: Mean CTS Scores by Study Phase
Background: Team-based learning (TBL) and high-fidelity simulation (HFS) can be used to reinforce the pathophysiology of various disease states.

Objectives: We sought to report observations of first year medical students after a combined TBL and HFS exercise was introduced to reinforce the pathophysiology of diabetic ketoacidosis (DKA).

Methods: Two high-fidelity SIM scenarios were developed and incorporated into the preclinical curriculum. Half of the students were assigned to undergo the TBL portion of the exercise first. Students were surveyed at the completion of the exercise. Chi-square test was used to compare associations.

Results: One hundred and seventy-six (99%) of 178 students completing the exercise returned surveys. One hundred and sixty-four (94%, n=175) students reported that the exercise helped them to better understand the pathophysiology of DKA (n=107, strongly agree [SA], n=57, agree [A]). One hundred and sixty-five (94%, n=176) reported that the combination of TBL and HFS complemented each other and enhanced the learning experience (n=102, SA, n=63, A). One hundred and sixty nine (96%, n=176) felt that working as a team was a valuable experience (n=109, SA, n=60, A). Ninety five (51%) students completed the TBL portion of the exercise first. Students who completed the TBL portion of the exercise first more often “strongly agreed” that working as a team allowed them to better understand the material (64/88, 73%, TBL first) vs. (41/86, 48% HFS first) (p=0.001). In addition, those who completed the TBL portion first more often “strongly agreed” that the combination of TBL and HFS complemented each other and enhanced the learning experience (62/90, 69%, TBL first) vs. (40/86, 47% HFS first) (p=0.003).

Conclusion: The exercise was felt to be very beneficial as most students reported the exercise helped them to better understand the pathophysiology of DKA and the combination of TBL and HFS complemented each other. This exercise was also uniformly reported that working as a team was a valuable experience. However, it appears that having students complete the TBL portion of the exercise first may further enhance the experience, as those completing the TBL portion first were more likely to SA that working as a team allowed them to better understand the material. In addition, those completing the TBL portion first were more likely to SA that the combination of TBL and HFS complemented each other.

491 Pilot Phase Findings From High-fidelity In Situ Medical Simulation Investigation of Emergency Department Procedural Sedation
Leo Kobayashi
Alpert Medical School of Brown University, Providence, RI

Background: Adverse events of varying severity occur during 17% of emergency department procedural sedations (EDPS). In situ simulation (SIM) may assist research-driven development and implementation of EDPS safety systems.

Objectives: Investigators initiated the Simulation Learning Initiative in Procedural Sedation Training for Routine Engagement of Anticipatory Maneuvers [SLIPSTREAM] program to 1) assess the feasibility of in situ EDPS SIMs and 2) evaluate the SIM’s methodology’s ability to generate objective data for system safety analysis.

Methods: Two high-fidelity SIM scenarios were developed and featured EDPS preparation, induction, maintenance, and recovery phases with manikin states, branchpoints, adverse events, and patient safety probes (e.g., defective bag-valve-mask). Checklists for EDPS critical actions and patient safety behaviors were developed through review of published guidelines, institutional protocols and forms, and expert consultation. Institutional review board approval was obtained. Pilot sessions assessed the study protocol structure and limitations, scenario face and content validity, data acquisition functions, and simulation EDPS checklists.

Results: Five emergency medicine (EM) interns (0±0 live EDPS experience) and five EM attending physicians (51±16 EDPS; p=0.006) with similar SIM exposure piloted the scenarios over three months. Between-group differences in compliance with institutional EDPS protocols were detected for pre-sedation oxygenation (p=0.008) and EtCO2 monitoring (p=0.004). Twenty percent of interns and all attendings (p=0.024) optimally managed EDPS complications. Sixty percent of interns and 80% of attendings (NS) recognized patient potential for difficult sedation; recognition of defective equipment did not attain statistical significance (33% interns [n=3 due to protocol errors] vs. 80% attendings). Pilot data resulted in derivation of a 10-point simulation EDPS safety composite score correlating strongly with live EDPS experience (r=0.838); a cutoff value of 6.7 exhibited 80% sensitivity, 100% specificity, 100% PPV, 75% NPV, and 88% accuracy for detecting experienced operators.

Conclusion: Pilot sessions tested an in situ EDPS study protocol, SIM scenarios, and checklist tools that appear to constitute an effective methodology to elicit and compare EDPS performance.

492 Point-of-care Beta-hydroxybutyrate as a Predictor of Length of Emergency Department Stay in Pregnant Patients With Nausea, Vomiting, and/or Hyperemesis Gravidarum
Aaron Stavinoa
Washington University in St Louis, Valley Park, MO

Objectives: Nausea and vomiting (N/V) affect 85% of pregnant women and are frequent causes of ED visits. The ED physician must distinguish between uncomplicated nausea/vomiting (“morning sickness”) and hyperemesis gravidarum (HG) because this affects treatment (including choice and quantity of IV fluids) and disposition. We sought to evaluate the utility of a point-of-care finger-stick beta-hydroxybutyrate (BHB) concentration in the work-up of pregnant women with N/V.

Methods: IRB-approved, prospective study of pregnant women in the ED with chief complaint of N/V. Exclusions were age < 18 years, history of diabetes or gestational diabetes, T >38.3 C, altered mental status, prisoner, or > 1 L of IV fluid given before screening. Consented patients received finger stick BHB at triage or upon placement into a treatment room. BHB < 0.5 mmol/L is normal, BHB >/= 1.0 mmol/L is abnormal, with an intermediate range >/= 0.5 to < 1.0 mmol/L. BHB results were placed in the ED chart and were available to the treating ED physician. We recorded times for arrival, BHB, urinalysis, and disposition. We compared BHB to urine ketone, anion gap (if obtained), final diagnosis, and time to disposition.

Results: We consented 57 patients, of whom 14 were excluded (1 negative beta-HCG, 5 LWBS/AMA, 6 BHB not recorded, 2 consent packets opened and not used), leaving 43 evaluable patients. Out of 43 patients, the BHB was normal in 28/43 (65%), intermediate in 5/43 (12%), and abnormal in 10/43 (23%). Of these subgroups, the final diagnosis was HG in 8/28 (29%), 5/5 (100%), and 8/10 (80%), respectively.

Conclusion: Elevated BHB was associated with a final diagnosis of HG. BHB was obtained before the UA in 37/43 (86%) cases. Point of care BHB allows earlier diagnosis of HG than UA ketones, and may expedite appropriate treatment and disposition.

John Stein, Ralph Wang, Alecia Martin, Alfredo Cortez, Manish Asaravala, Teri Reynolds, and Vanessa Jacoby
University of California, San Francisco, CA

Objectives: Pelvic ultrasound by emergency physicians has been shown to be both an accurate and efficient means of...
evaluating patients at risk of ectopic pregnancy (EP). However, controversy still exists regarding the generalizability of this technology because much of the previous research did not use a standardized training and credentialing guideline.

Objectives: We sought to assess the clinical performance of emergency department (ED) bedside pelvic ultrasound using physicians trained and credentialed according to current emergency medicine ultrasound guidelines.

Methods: This was a prospective study of consecutive first trimester pregnant female ED patients presenting with abdominal pain or vaginal bleeding. Patients were enrolled between January 2007 and October 2010. All physicians were trained and credentialed according to the guidelines set forth by both the American College of Emergency Physicians (ACEP) and the Society for Emergency Medicine (SAEM), which included initial didactic training and a minimum of 25 exams in the pelvic ultrasound discipline. Patients received 1) a pelvic transabdominal and, if needed, a transvaginal ultrasound performed by the attending physician who documented intrauterine pregnancy (IUP) status, and 2) subsequent radiologist pelvic ultrasound and eight week telephone and clinical record follow-up for determination of outcomes. Sensitivity was defined as the proportion of patients with ectopic pregnancy for which ED ultrasound demonstrated no IUP.

Results: There were a total of 703 potentially eligible patients, 575 (82%) were actually assessed. Eighty-one were found to be ineligible and 25 were not available for follow-up, giving a final study population of 469 patients. There were 42 ectopic pregnancies (prevalence 9%, 95% CI 6.5–12). Forty attending physicians performed ultrasounds with a range of 1 to 51 exams (median 11, IQR 3 to 15). When compared to final outcomes, ED ultrasound showed the following test characteristics (95% CI): sensitivity 100% (92–100), specificity 53% (49–58), negative predictive value 100% (98–100), and positive predictive value 17% (13–23). Overall, 228 of 469 patients (49%) were diagnosed with IUP.

Conclusion: Emergency physicians who follow the currently recommended emergency ultrasound guidelines can perform pelvic ultrasound examinations with excellent test characteristics when evaluating patients at risk of EP.

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**494 Inter-rater Reliability of Sonographic Features of Early Intrauterine Pregnancy by Emergency Bedside Sonographers**

Katherine F Catallo, Arthur Au, Masashi Rotte, Bon Ku, and J. Matthew Fields

*Thomas Jefferson University Hospital, Philadelphia, PA*

Background: Emergency physicians (EPs) routinely perform bedside ultrasound (US) to diagnose intrauterine pregnancy (IUP). The sonographic findings in early IUP include the double decidual sign (DDS), yolk sac (YS), and fetal pole (FP). Alternatively, no specific (NS) findings may be seen. The inter-rater reliability of these findings has never been described in either the hands of EPs or radiologists.

Objectives: We set out to determine the inter-rater reliability of EPs in identifying NS, DDS, YS, and FP in early IUPs.

Methods: Three cohorts of EPs were included: emergency medicine (EM) residents (2–4 weeks of US training; 10–25 pelvic US), attending physicians (>4 weeks of US training and >25 pelvic US), and fellowship-trained attending physicians, considered experts in their field (>1 year of US training and >100 pelvic US). EPs were asked to evaluate 43 still pelvic US images from a database of studies from women with a positive pregnancy test and an estimated gestational age of 2–12 weeks by last menstrual period. EPs were asked to identify DDS, YS, and/or a FP in each image, or if the study showed no specific signs of IUP. Inter-rater reliability was determined using Fleiss’s non-weighted kappa using Stata 11.

Results: Twenty-one EPs met inclusion criteria. Inter-rater reliabilities (kappa) are shown in Table 1. Agreement was highest between experts and lowest between residents. There was moderate to substantial agreement for NS and IUP in both experts and attending physicians. There was poor to fair agreement (experts) in identifying DDS.

Conclusion: Emergency physicians with at least four weeks of US training and 25 pelvic US demonstrate substantial agreement in determining IUP and non-IUP states. There was less agreement between residents, which may be due to less experience. Even among expert raters, there was poor agreement as to the presence of a DDS, making it a less reliable marker for early IUP.

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**495 Pregnancy Status Affects Analgesia Administration in Pelvic Pain Patients**

Brigitte M Baumann1, Angela M Mills2, Frances S Shofer3, Lindsey Glaspey1, Nicole M Smith1, Christopher Spewock4 and Esther H Chen5

1Cooper University Hospital, Camden, NJ; 2University of Pennsylvania, Philadelphia, PA; 3University of North Carolina, Chapel Hill, NC; 4Jefferson University, Philadelphia, PA; 5University of California, San Francisco, San Francisco, CA

Background: Oligoanalgesia can be influenced by several patient factors, such as age and race.

Objectives: We hypothesized that pregnant (P) patients who present with pelvic pain to the emergency department (ED) are less likely to receive analgesia compared to non-pregnant (non-P) patients.

Methods: A multicenter prospective cohort study was conducted with females aged 18–50 years presenting with suprapubic, left, or right lower quadrant pain from 2/08–8/08. Demographics, acuity level, pain score at triage, and final disposition were recorded. Analgesic use and pain scores were categorized into quartiles. Demographics, analgesic (non-narcotic and narcotic) use, and pain scores were compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01). Analgesic use was compared between the P and non-P groups (P<0.01).

Results: Of 245 women, 74 (30%) were pregnant, 128 (52%) black, and 63 (26%) Hispanic. The mean age of participants was 26 ±6 (P) and 32 ±9 (non-P) years, p<0.001. Mean triage level was 3.1 in both groups, p=1, and the mean triage pain score was 7.0 ±2.8 (P) and 7.6 ± 2.6 (non-P), p=0.09. Pregnant women received an analgesic (non-narcotic and narcotic) less frequently than non-P patients during their ED visit: 16 (22%) vs 98 (57%), p<0.001. Non-narcotic medications (acetaminophen or an NSAID) were given to 10 (14%) (P) vs 45 (26%) (non-P), p<0.001. Narcotic medications (Percoct, Tylenol#3, morphine, hydromorphone) were given to 8

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Table 1: Inter-rater Reliability (Kappa) of Early IUP Sonographic Findings by Emergency Physicians

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<tr>
<th></th>
<th>NS</th>
<th>DDS</th>
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<table>
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<tr>
<th></th>
<th>NS-No Specific Findings of Intrauterine Pregnancy</th>
<th>DDS-Double Decidual Sign</th>
<th>YS: Yolk Sac</th>
<th>FP- Fetal Pole</th>
<th>IUP-Intrauterine Pregnancy</th>
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496 Barriers to Prenatal Care Among Women Presenting to the Emergency Department
Priya E Mammen, Paul Dominici, Dilies Ngu, and Nina Joyce
1Albert Einstein Medical Center, Philadelphia, PA; 2Beth Israel Deaconess Medical Center, Boston, MA

Background: Early and adequate prenatal care (PNC) has an established association with a reduction in poor birth outcomes. While increased Medicaid funding has expanded access, barriers to PNC still exist. The pregnant population presenting to the emergency department (ED) may have low rates of PNC.

Objectives: This study serves to determine characteristics of pregnant women presenting to the ED and to identify some of the barriers to initiating PNC among these patients.

Methods: A single-round, cross-sectional survey was administered to all pregnant women accessing health services through the ED at an urban tertiary care center during a three month period. Any woman with hemodynamic instability or in need of urgent or emergent intervention and those who refused consent were excluded. Data were analyzed using t-tests and logistic regression models.

Results: A total of 201 pregnant women were enrolled; 80% presented with known pregnancy status, while 20% were diagnosed in the ED. Women with a known pregnancy had a mean age of 25.0 years, mean gravidia of 3.37, and mean parity of 1.49. Of these, 47.5% (n=76) had initiated PNC, although 81.8% believed PNC was very important. The most common cited reasons for lack of PNC initiation were inability to schedule an appointment when desired (31.0%), lack of insurance/ Medicaid card (11.9%), and personal reasons (16.7%), such as not having time; 36.9% (n=31) did not provide a reason. After learning they were pregnant, 38.9% of the subjects sought care in a hospital ED, compared to 22.3% at OB-Gyn, 15.3% at a health center, and 7.6% at their primary care physician. Reported ED utilization increased from 29.9% before known pregnancy status to 38.9% after (p=0.003). Logistic regression reflects several characteristics with positive correlation to initiating prenatal care, namely having a PCP (p=0.03), greater duration of pregnancy at time of presentation (p=0.005), and higher level of education (p=0.003).

Conclusion: These results reflect that while the majority of pregnant women in this sample believe PNC to be important and intend to start PNC, barriers exist to its access, including patient motivation. The ED provides a unique opportunity to approach those women most at risk of inadequate PNC and could allow for appropriate and timely intervention and patient education by health care providers.
Breastfeeding Patterns in Female Emergency Medicine Residents
Sarah R Farris1 and Taher Vohra2
1Duke University Hospital, Durham, NC; 2Henry Ford Hospital, Detroit, MI

Background: Female emergency medicine (EM) residents who desire to have children face a difficult balance of career and family. While the American Academy of Pediatrics recommends six months of exclusive breastfeeding and one year of breastfeeding with supplementation, these goals are difficult to reach during residency. EM is a young specialty and there is no EM literature on this topic.

Objectives: We sought to describe rates and duration of breastfeeding, availability of accommodations for breastfeeding, and challenges to and satisfaction with breastfeeding for EM residents.

Methods: A survey was developed, pilot-tested, and revised. It was distributed to all US EM, EM/internal medicine (IM), and EM/IM/critical care residency programs registered in FREIDA in 2008. Program directors at each program were sent a cover letter and Survey Monkey link to distribute to their residents in April 2010. The residents were anonymously surveyed regarding demographics, breastfeeding behaviors, and accommodations for pumping. Simple descriptive statistics were performed.

Results: The survey received 53 responses from women who delivered live children during residency. Of these, 51/53 (96.2%) reported breastfeeding during residency. Subjects reported an average of 4.5 months of exclusive breastfeeding and an additional 3.7 months of breast-feeding with supplementation. Thirty of 51 (58.9%) subjects reported being very or somewhat unsatisfied with the duration of breastfeeding. Twenty-seven of 46 (58.7%) women reported not having a place to pump at work. Nearly all (45/46, 97.8%) found that having time to pump during a shift was a major challenge. Also cited were difficulty finding accommodations for pumping (29/46, 63.0%) and maintaining an adequate milk supply (31/46, 67.4%). Among pregnant residents, 25 of 26 (96.2%) reported plans to breastfeed. They hoped to breastfeed exclusively for an average of 5.4 months and for an additional 5.3 months of breastfeeding with supplementation.

Conclusion: Most EM residents felt it was acceptable for residents to have children in residency. Most would rearrange their schedules for their pregnant colleagues and do not feel they are less efficient. This may explain why many do not feel pregnant colleagues should receive special considerations. Overall, it seems that EM residents are supportive of their colleagues having children in residency.
Background: The diversion of ambulances from their intended emergency departments (EDs) occurs frequently, compromising patient care. In a previous study, we reduced ambulance diversion (AD) by 74% in a large urban area.

Objectives: In this follow-up study we describe an innovative and sustainable 3-2-1 plan towards a regional no-diversion policy.

Methods: We specified tight diversion criteria and electronically monitored diversion in 17 EDs. Initially, AD at each ED was limited by protocol to 3 hours at a stretch, after which incoming ambulances had to be accepted at that ED for at least 1 hour before additional AD could be requested. After 6 months, AD was limited to 2 hours per diversion event; finally, 6 months later, AD was limited to only 1 hour. The monitoring for this AD was programmed into a regional, internet-based emergency medical services (EMS) program.

Results: Total annual AD decreased from 8,469 hours in 2006 (pre-implementation) to 4,592 hours in 2007 (during implementation), and finally to 2,439 hours and 2,306 hours in 2008 and 2009 (post-implementation), an 87.4% (95% CI, 64.6% to 95.5%) reduction, while one county within the region eliminated AD altogether in its three EDs. There were 236 AD events per month in 2006, 156 in 2007, 164 in 2008, and 174 in 2009. Notably, this reduction in AD hours occurred despite overall increases in EMS arrivals to the ED (7.8%), ED census (13.0%), hospital admissions from the ED (6.6%), intensive care unit admissions from the ED (17.1%), and overall Sacramento population (1.9%).

Conclusion: By limiting the duration of AD events in a large urban area to progressively shorter periods of time using a regional, internet-based EMS program, we significantly reduced AD hours in 17 EDs and eliminated AD in three of these 17 EDs. This original, collaborative 3-2-1 plan may be readily reproduced across the country to progressively reduce and possibly eliminate ambulance diversion.

Objectives: To implement the validated SPEED instrument in two large urban EDs and, thereby, assess palliative care needs for presenting cancer patients.

Methods: A screening for active cancer was built into the electronic medical record systems in the EDs at Northwestern Memorial Hospital (NMH) and Emory University Hospital (EUA). All patients presenting to the EDs at these two institutions are screened for active cancer (active cancer treatment in the last year or known metastatic disease). All patients who screen positive for active cancer are administered the five-question SPEED instrument to assess difficulty with: 1) pain, 2) getting care needs met at home, 3) medications, 4) suffering from feeling overwhelmed, and 5) getting medical care that fits with goals.

Results: SPEED was completed for 596 cancer patients over a span of 138 consecutive days at NMH and for 834 cancer patients at EUA over a span of 240 consecutive days. Close to 50% of all cancer patients at both sites scored above the threshold for current pain severity. Approximately 25% of cancer patients at both sites scored above threshold for the other four SPEED questions. In all cases, there was no significant variation between the two sites.

Conclusion: Cancer patients who present to the ED demonstrate significant palliative care needs. Without formal screens, it is likely that these needs would go undetected. It is important that these needs are addressed in order to improve the quality of care that these patients receive.
within 3 days. Despite this, patients chose the ED as their source of care for their minor medical issue. When asked where they could have sought alternative care, less than 30% identified a family doctor, walk-in clinic, or urgent care centre as an option. Five hundred and thirteen (43.5%) of respondents felt their concern was very urgent or life-threatening.

**Conclusion:** Although the majority of patients in this study were well-educated and had a family doctor and wait times were minimal, the perceived seriousness of a low triage complaint played a major role in the decision to choose the ED as the source of care.

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**504 Abnormal Triage Vital Signs Are Associated With Intensive Care Unit Admission**

Francis J O’Connell, Daniel C McGillicuddy, Jonathan C Roberts, Louisa S Canham, Nathan I Shapiro, and Leon D Sanchez

Beth Israel Deaconess Medical Center, Boston, MA

**Background:** We recently instituted a triage program where abnormal vital signs criteria are used to “trigger” a prioritized emergency department (ED) assessment as an adjunct in the triaging of ED patients. Often these patients are admitted to an intensive care unit (ICU) until their condition stabilizes.

**Objectives:** To define the association between the individual components of our predefined ED triage triggers criteria and ICU admission.

**Methods:** This was a retrospective cohort study of ED patients for eight randomly selected five-day periods in 2007–2009. Inclusion criteria were ED adult patients (age >17y) who met our predefined “trigger” criteria: heart rate (HR) < 40 or > 130, respiratory rate (RR) < 8 or > 30, systolic blood pressure (SBP) < 90, oxygen saturation (Sat) < 90% on room air. We compared ICU admission rates between triggers and non-triggers patients using Fisher’s exact test. We also constructed a multiple logistic regression model to identify independent predictors of ICU admission, and report 95% confidence intervals (CIs) with alpha = 0.05.

**Results:** There were 211/5758 (3.7%) patients who met triggers criteria. The ICU admission rate was higher among triggers versus non-triggers patients (36.5% vs. 6.8%, p<0.001). Among individual triggers criteria, ICU admission rates were: HR > 130 (13/64, 20%), RR > 30 (18/26, 69%), SBP < 90 (18/45, 40%), Sat < 90 (20/52, 39%), and if there were >2 triggers present (14/19, 74%). Using logistic regression we identified Sat < 90 (odds ratio 2.3, 95% CI 1.01 - 5.0), SBP < 90 (2.4, 1.1-5.5), and two concomitant triggers (10.1, 3.1 - 32) (p<0.05 for all) as independent predictors of ICU admission. The c-statistic for the model was 0.65 showing fair performance.

**Conclusion:** A significant association between triage triggers vital signs and ICU admission exits. A broader look at all ICU admissions in the ED may yield further details about the predictive nature of triggers criteria.

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**505 Derivation Study: Early Identification of Days With High Risk of Patients Leaving Without Being Seen**

Drew B Richardson

Australian National University, Canberra, Australia

**Background:** The proportion of patients who do not wait to be seen (DNW) is a quality measure but varies during the day, usually being worst in evenings.

**Objectives:** To identify practical predictors of daily DNW which are valid early in the day.

**Methods:** Retrospective descriptive analysis of 364 consecutive 24 hour periods beginning at 05:00 am (57,642 presentations) from a mixed tertiary emergency department (ED). The dependent variable was daily DNW. Potential predictors calculated hourly were the number of patients waiting, being treated, arriving, awaiting inpatient beds, in observation ward, in acute area, and combinations. Multivariate analysis of daily means seeking to understand risk factors for DNW was followed by multivariate analysis of 11:00 am data. Days were classified as HIGH or LOW either side of 10% and individual potential predictors were tested using ROC curves.

**Results:** All potential predictors were positively correlated with DNW. Multivariate analysis showed daily DNW was most strongly associated with mean number waiting (r=0.77) and then weakly with daily boarders. At 11:00 am it was most strongly associated with mean total occupancy excluding observation unit. ROC analysis found that a threshold of 33 of mean occupancy at 11:00 am was the best single predictor. Retrospective testing further showed that days when this threshold was exceeded at any time up to 11:00 am were even more likely to have HIGH DNW (64% of 187 vs 38% of 176, P<0.001).

**Conclusion:** Total occupancy is a simple and plausible predictor of daily DNW which is potentially useful because it is amenable to intervention by ward admission and expedited ED discharge. If prospectively validated, this measure has potential to identify days at high risk of DNW before a significant number of patients have left, and thus allow intervention.
a single tertiary academic, urban, Level 1 trauma center with over 85,000 visits/year. From January 2009 through July 2010, a total of 129,175 patients were seen in the ED, with 2,730 patient satisfaction surveys received. Two groups of physicians were compared: top-ranked physicians were defined as those with overall patient satisfaction scores in the top 20% of the group, while bottom-ranked physicians were those with patient satisfaction scores in the bottom 20% (n=7 for each group, with 597 vs. 512 surveys, respectively, used for each group). Independent sample t-test stratified by quintiles of average wait time were used to examine the association.

Results: Overall, patient satisfaction was inversely correlated to wait time. There were no statistically significant differences between top-ranked vs. bottom-ranked physicians on overall ED patient satisfaction after adjusting for wait time, excepting those waiting 46-56 minutes on average (see the Figure).

Conclusion: This retrospective analysis suggests that for those patients with brief or extended waits, being seen by a top-ranked physician does not significantly affect overall patient satisfaction when compared to bottom-ranked physicians. For patients with intermediate waits, being seen by a top-ranked physician may influence overall patient satisfaction.

507 Descriptive Study of Acoustic Environment in Two Active Emergency Departments
Jeremy Ackerman1, Arun Mahapatra2, Selin Okcu2, Craig Zimring2, and Erica Ryherd2
1Emory University School of Medicine, Atlanta, GA; 2Georgia Institute of Technology, Atlanta, GA

Background: Creating therapeutic acoustic environments in emergency departments is a unique challenge due to the complex assortment of sound sources and limitations in acoustic treatments. Too often emergency departments are noisy and stressful; the complex auditory environment or "soundscape" has long been a source of complaints. While there is some evidence that a poor soundscape contributes to staff stress, loss of productivity, medical errors, and miscommunication, there are surprisingly little data describing the soundscape beyond simple sound pressure level measurements. Without this information, it is difficult to develop strategies to actually improve the soundscape.

Objectives: Perform a comprehensive acoustic description of two active emergency departments to determine acoustic factors that are likely to significantly affect patient care.

Methods: We present a detailed acoustic study of two active emergency departments within the observation unit, patient rooms, and work areas. Validated acoustic metrics such as the Speech Intelligibility Index (SII) were measured and calculated, as were characteristics of sound fluctuation and content. These were compared to known effects and current published standards.

Results: Results show overall sound levels between 50-63 dBA, which exceeds the 30 dBA guideline set by the World Health Organization. These sound levels varied drastically over time, sometimes exceeding 100 dBA, resulting in a pattern of fluctuations more similar to chaotic traffic noise than to a working environment. In all staff work areas and half of patient rooms studied, the SII did not exceed 0.45 for normal speech - considered to be "poor" speech intelligibility. No locations recorded a "good" SII did not exceed 0.45 for normal speech - considered to be "good" SII, which exceeds the 30 dBA guideline set by the World Health Organization. These sound levels varied drastically over time, some-

509 Validation of an Emergency Department Chart Review Quality Assurance Method to Assess 72-hour Revisits Who Are Admitted to the Hospital
Jameel Abualenain1, William J Frohna2, Mark S Smith2, Michael D Pipkin3, Cynthia M Webb4, and Jesse M Pines1
1The George Washington University, Washington, DC; 2Washington Hospital Center, Washington, DC; 3Franklin Square Hospital Center, Washington, DC; 4Union Memorial Hospital, Washington, DC

Background: The medical records of patients discharged from the emergency department (ED) who return within 72-hours and are admitted on the second visit (72H-RA) are often reviewed for potential quality issues.

Objectives: We sought to validate a quality assurance (QA) methodology to assess 72H-RA.
Methods: Data gathered from three hospitals within the Medstar Health system: Washington Hospital Center (WHC) (2008–10), Franklin Square Hospital Center (FSHC) (2006–9), and Union Memorial Hospital (UMH) (2005–9). All 72H-RA encounters underwent quality assurance (QA) review by emergency medicine physician leadership locally (six physicians across the three hospitals). The index visit was assessed for quality of care (1-standard of care (Std), 2-mild/moderate deviation from Std, 3-poor, significant deviation from Std) and patient outcome (A - no change, expected progression or failed appropriate treatment, B - moderate, C - adverse, D - poor). In a random sample of 50% of all 72H-RAs, a blinded QA reviewer performed a blinded QA review and scored each chart using this scoring system. Percent agreement and weighted kappa were calculated to assess inter-rater reliability. Excluded were left without being seen, left against medical advice, transferred, or admitted during the index visit.

Results: In 3,810 72H-RA ED encounters included, 189 (5% sample) underwent blinded QA review. In terms of quality, the initial reviewer scored 183 charts (97%) as high quality and 6 (3%) as medium. The study reviewer scored 178 (94%) as high quality and 11 (6%) as moderate. In terms of outcome, the initial reviewer scored 183 (97%) as no change, 3 (2%) as moderate, and 3 (2%) as poor outcome. The second reviewer scored 177 charts (93%) as no change, 9 (5%) as moderate, and 4 (2%) poor outcome. Complete agreement was assessed in 182 (96%) of index quality of care assessments (weighted kappa = 0.91), and in 181 (95%) of outcome assessments (weighted kappa = 0.86).

Conclusion: Both poor quality and poor outcomes of care in 72H-RA in the ED are rare. However, there is good agreement of both quality and outcome in blinded chart review. Therefore, this local chart methodology is valid to assess quality and outcome in 72H-RA. In order to further validate this methodology, additional studies are needed in larger numbers of patients and in different hospital settings.

510 The Effect of an Emergency Department-specific Fall Risk Assessment Tool in Decreasing Preventable Falls
Christine Waszynski, Terry Kinsley, Danette Alexander, Lincoln Abbott, Kyle Finnegan, and Joao Delgado
Hartford Hospital, Hartford, CT

Background: Emergency department (ED) patients represent a high fall risk group. Fall risk screening tools validated for inpatient settings are not as sensitive in identifying high fall risk patients in the ED, often missing intoxicated patients. An analysis of falls in our ED showed that 40% of the patients who fell were not identified as a fall risk prior to the fall. In addition, 38% of the falls occurred in patients under the influence of alcohol or drugs.

Objectives: The purpose of this study was to evaluate the effect of a fall prevention protocol and a modified screening tool to identify high fall risk patients in the ED setting.

Methods: We performed an observational study with a before/after design. The main experimental intervention was the introduction of a modified Fall Risk Assessment Tool and implementation of a fall prevention protocol in patients identified at risk of falling. The tool was revised from a validated inpatient screen to include patients age 70 and older and intoxicated patients. Each patient is assessed at triage and reassessed as needed. When high risk patients are identified, a protocol is initiated which includes visual indicators of fall risk (ED tracker icon, bracelet, room sign), patient instruction to call for assistance with toileting or ambulation, and discretionary use of exit alarms by staff. We also instituted periodic rounding by trained volunteers in specific areas of the ED during the highest volume periods (8AM-12AM). Proportion of falls between the pre- and post-intervention period were compared with Pearson chi-Square.

Results: During the 20-month baseline period, we had 0.49 falls/1000 patients vs. 0.26 falls/1000 patients in the post-intervention period (p=0.044). Of the five falls reported in the post-intervention period, two occurred in patients who had not been identified as high risk and were deemed accidental. The other three were identified as high fall risks prior to the fall but did not have appropriate preventive measures instituted. Of note, there were no falls in the areas staffed by the volunteers (0, 95% CI 0-0.2).

Conclusion: Falls have decreased in our ED by 0.23/1000 patients since the implementation of a modified fall risk screening tool. In our ED this corresponds to 22 falls prevented/year. Further study is needed to identify if this reduction is due to improved identification of fall risk patients, more effective interventions to prevent falls, or both.

511 Regional Implementation of New Intake Processes Improves Access to Care for Mid-acute Patients in Three Urban Emergency Departments
Grant Innes, Lester Mercuer, Dongmei Wang, Shawn Dowling, and Eddy Lang
University of Calgary, Calgary, AB, Canada

Background: The evaluation of mid-level acuity patients who present to the emergency department (ED) is often hampered by access block.

Objectives: The goal of this study was to describe the effect of a three-phase evolution in re-engineered processes of care for mid-level acuity patients instituted in a three-hospital region serving over one million inhabitants.

Methods: Using administrative databases, access and quality of care were compared during three 5–10 month periods from 2008 to 2010. In Phase I (2010), know as Triage-in (TI), patients were evaluated and triaged in dedicated hospital zones instead of a formal process of care. In Phase II (2009), known as Waiting Room Care (WRC), physicians assessed patients in spaces located off of the main ED but without dedicated infrastructure. In both of these latter phases, patients requiring additional therapy or observation could be transferred to treatment or “awaiting results” zones. Phase I (2008) served as a control and did not employ novel care spaces. Primary outcomes were median time from triage to physician assessment, percent of patients seen in WRC/TI, left without being seen (LWBS), and unplanned revisits. Kruskal-Wallis and chi-square tests were used for comparisons. The Canadian Triage and Acuity Scale (CTAS) was used to define acuity and all CTAS III patients presenting to EDs in the region during these three phases were included in the analysis.

Results: A total of 62,917 CTAS III visits were included in the analysis. The proportion treated in TI/WRC areas increased from 4.3% to 26.1% to 51.7% (p < 0.001) over the three phases. Median triage to physician assessment time fell significantly over the three phases of the study (157 versus 149 versus 135 minutes, respectively, P < 0.001 for all comparisons). The improvements in throughput yielded a reduction in LWBS from 12.5% to 10.9% to 8.6% over the study period (P <0.001). Unplanned revisits within 72 hours were unaffected over the latter two phases; 7.1% vs. 8.9% vs. 8.8%, respectively (P = NS for latter two). Potential confounders did not influence these results and overall volume of CTAS III patients actually increased over the three phases.

Conclusion: We describe the positive effect of the first regionally-implemented program for improving ED access times for mid-level acute patients. These novel processes of care yielded significant improvements in access to care and generated improvements in quality of care.

512 Urinalysis Reflex Testing in the Emergency Department
Christopher Jones, Karissa Culbreath, Abhi Mehrrota, Peter Gilligan, and Frances Shofer
University of North Carolina, Chapel Hill, NC

Background: Automated urinalysis (UA) and urine culture are both frequently utilized in the emergency department (ED) to
evaluate for urinary tract infection (UTI). Low culture growth rates are common, resulting in unnecessary costs and wasted laboratory resources. Reflex testing protocols rely on initial test results to help make decisions about how to utilize subsequent tests.

**Objectives:** Our objective was to develop an ED-based reflex testing algorithm which would use UA results in order to limit urine culture use, while maintaining sufficient sensitivity and specificity for clinical application. We hypothesized that using a reflex testing approach to UA and urine culture would significantly reduce the number of negative cultures ordered from the ED.

**Methods:** We performed a retrospective chart review of all patients age 5 and older who presented to the University of North Carolina ED between July 1st 2009 and January 1st 2010 who had both a UA and urine culture collected during their ED visit. Cultures were designated as clinically-significant based on prospective criteria designed to identify those cultures which represented pathogenic organisms, as opposed to probable contaminants. UA components included WBC, leukocyte esterase, nitrite, and detection of bacteria. Combinations of these UA results were tested using receiver-operator characteristic curves to develop a reflex testing protocol maximizing sensitivity and specificity to predict clinically-significant urine culture growth.

**Results:** A total of 1546 ED patients met inclusion criteria. Of these, 576 (24%) had cultures which were positive for any growth, and 284 (18%) cultures grew clinically-significant organisms. Limitation of urine culture testing to those UA samples with WBC ≥ 5, positive nitrites, leukocyte esterase of “trace” or greater, or detection of any bacteria would have provided a sensitivity of 98% and specificity of 47% for the growth of clinically-significant organisms. Use of this reflex protocol would have eliminated 601 (39%) of the 1546 cultures, 5 (0.3%) of which yielded clinically-significant culture results.

**Conclusion:** The implementation of a reflex UA testing protocol would have significantly decreased the number of unnecessary urine cultures performed in this cohort of ED patients, while maintaining an acceptable false negative rate. Prospective validation is required to confirm these results.

513 **Effect of a Walk-in-centre On Emergency Department Crowding**

Drew B Richardson

Australian National University, Garran, Australia

**Background:** Walk-in-centres have been proposed as a means of reducing emergency department (ED) workload. The first Australian hospital-based nurse-led walk-in-centre was recently opened on a tertiary hospital campus and heavily promoted with an announced aim of relieving ED crowding. Early experience suggested an increase in low-acuity ED presentations.

**Objectives:** To describe the changes in ED workload at 6 months after the May 2010 opening of a walk-in-centre on a tertiary hospital campus.

**Methods:** Scheduled 182 day prospective descriptive cohort study entered in ANZ Clinical Trials Registry with primary controls of the preceding 182 days and the same 182 days of the previous year in a mixed tertiary ED and secondary controls of the same three periods in the other ED in the same city. Daily means of ED presentations, ward admissions, and ED occupancy (patient-care time) by those presentations were calculated from the ED information system. The null hypothesis was that the walk-in-centre was not associated with any change in ED workload. Subsequent analysis compared demand with the same periods over the preceding 7 years.

**Results:** There was a highly significant (P<0.0001) increase in daily presentations, admissions, and occupancy in the tertiary ED compared to both control periods as shown in the Table. At the same time presentations to the nearby urban ED decreased significantly (5.7% presentations daily) on the previous year and increased marginally (1.0%) on the previous 6 months. Subsequent analysis showed both the seasonal and annual increase in the tertiary ED to be significantly greater than the average of the previous 6 years but similar in magnitude to the last 3. The analysis was repeated on 175 days of data because a disaster response occurred in the final week but the results were not meaningfully different (5.7% increase in presentations not 6.2%).

**Conclusion:** Opening of the walk-in centre was directly associated with a clinically and statistically significant increase in tertiary ED workload of 6% and a greater increase in crowding over the first 6 months. It is possible that some of the increase represented patients who would previously have chosen to present at the other ED in the city, but the decrease there was not sufficient to explain all the tertiary increase. The centre did not achieve its stated aim.

<table>
<thead>
<tr>
<th>Tertiary ED Workload and Crowding</th>
<th>Mean (95% CI)</th>
<th>Previous Year</th>
<th>182 days before</th>
<th>Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentations</td>
<td>156.2 (154.2–158.2)</td>
<td>156.2 (154.1–158.2)</td>
<td>165.8 (163.5–168.1)</td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>33.2 (32.4–34.0)</td>
<td>33.2 (32.3–34.0)</td>
<td>35.5 (34.6–36.3)</td>
<td></td>
</tr>
<tr>
<td>Admissions</td>
<td>28.4 (27.8–29.1)</td>
<td>27.9 (27.3–28.5)</td>
<td>31.4 (30.8–32.1)</td>
<td></td>
</tr>
</tbody>
</table>

514 **Queensland Pathology Ordering Project**

Kevin Chu1, Amol Wagholkar2, Jaimi Green-slade3, and Anthony Brown1

1Royal Brisbane & Women’s Hospital, Brisbane, Australia; 2The Australian E Health Research Centre, Brisbane, Australia

**Background:** Many strategies to rationalize test ordering have been reported. However, sustainable changes are difficult to achieve. This study is one in a series of projects investigating prospective pathology ordering in six emergency departments (EDs) across Queensland, Australia.

**Objectives:** To determine whether the use of a pathology request form allowing residents to order only a limited range of laboratory tests prior to consultation with an attending physician can reduce the number of tests ordered, specifically, coagulation profile (COAG), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), thyroid function tests (TFT), and D-dimer (DD).

**Methods:** A prospective pre and post study was performed in one adult university hospital. A pathology request form was designed to limit the tests that may be ordered by ED residents. The permissible list excluded COAG (except when taking warfarin), CRP, ESR, TFT, and DD. However, any test may be ordered following consultation with an ED attending physician. The new form was implemented over one week following the 20-week pre-intervention period in 2009. Data were recollected in the 20-week post-intervention period after a 32-week interval.

**Results:** There were 24,721 and 25,597 presentations in the pre and post periods respectively. Patient characteristics were unchanged in the two periods (mean age 41.7 vs 41.5 yr, male 51.7% vs 51.2%; admission rates 29.0% vs 29.1%). The numbers of complete blood counts and multi biochemical analyses ordered were similar in the two periods (mean 42.3 vs 38.1 /100 patients; 41.3 vs 37.8 /100 patients respectively). The ordering of COAG, CRP, ESR, TFT, and DD fell from the pre to post intervention period (mean 11.8 vs 9.3 /100 patients, p = 0.001; 5.6 vs 2.8 /100 patients, p = 0.001; 2.5 vs 1.4 /100 patients, p = 0.001; 2.2 vs 1.6 /100 patients, p = 0.001; 0.83 vs 0.75 /100 patients, p = 0.32, respectively).

**Conclusion:** Pathology request forms limiting tests that a resident may order prior to consultation with an attending physician is one method for rationalizing pathology ordering that appears sustainable over 12 months.

515 **Predictors of Ambulance Diversion in Nine Emergency Departments**

Nicholas Genes1, Ula Hwang1, Daniel A. Handel2, Jesse Pines3, Dominik Aronsky4, Adit A. Ginde5, Jeffrey Hackman6, Joshua A. Hilton7, Michael Kamali8, Emilie Powell9

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Nicholas Genes1, Ula Hwang1, Daniel A. Handel2, Jesse Pines3, Dominik Aronsky4, Adit A. Ginde5, Jeffrey Hackman6, Joshua A. Hilton7, Michael Kamali8, Emilie Powell9
Background: Ambulance diversion is employed in many emergency departments (EDs) as a means to relieve crowded conditions. Objectives: We sought to determine factors associated with daily diversion.

Methods: This retrospective, multicenter study included nine geographically disparate EDs. Daily ED operational variables collected from 1/1/09-12/31/09 included number of admitted, discharged, eloped and total ED patients; average overall length of stay (LOS), and average LOS for admitted, discharged and eloped patients; number of ED beds; hours on ambulance diversion; and whether the site used predefined standards for diversion. The outcome was whether an ED went on diversion at least once during a 24-hour period (Y/N). Calculated predictor variables included ED workload rate (total number of daily ED patients * overall average 24-hour period / number of ED beds), and admission and elopement rate (daily percentage of admitted or eloped patients). A multivariable logistic generalized estimating equation model was used while controlling for seasonal variation and clustering within each site.

Results: Emergency department census ranged from 43,000–101,000 patients. Overall, 36.8% of total days involved daily diversion (range at sites was 4.9–86.6%). In the adjusted models, higher ED workload rate was associated with increased diversion (OR 1.05 [95% CI 1.05, 1.06] for each additional patient LOS hours per ED bed). Higher admission and elopement rates, and longer LOS for admitted patients, and weekdays, but not having predefined standards for diversion.

Conclusion: Ambulance diversion decisions are correlated with higher ED workload rate, higher elopement and admission rates, longer LOS for admitted patients, and weekdays, but not having predefined standards for diversion.

Table 1.

<table>
<thead>
<tr>
<th>Factor for Diversion</th>
<th>Odds Ratio</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupancy Rate</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Elopement Rate</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>&lt;5%</td>
<td>0.91</td>
<td>0.74, 1.13</td>
</tr>
<tr>
<td>5 - 10%</td>
<td>3.38</td>
<td>2.38, 4.8</td>
</tr>
<tr>
<td>10 - 15%</td>
<td>9.33</td>
<td>6.21, 14.02</td>
</tr>
<tr>
<td>&gt;15%</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>Admission rate</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>&lt;15%</td>
<td>1.37</td>
<td>0.99, 1.9</td>
</tr>
<tr>
<td>15 - 20%</td>
<td>2.32</td>
<td>1.65, 3.27</td>
</tr>
<tr>
<td>20 - 25%</td>
<td>8.46</td>
<td>6.00, 11.94</td>
</tr>
<tr>
<td>&gt;25%</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>Boarder LOS</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>&lt;6 hours</td>
<td>1.48</td>
<td>1.05, 2.09</td>
</tr>
<tr>
<td>6 - 8 hours</td>
<td>1.95</td>
<td>1.36, 2.8</td>
</tr>
<tr>
<td>8 - 10 hours</td>
<td>6.34</td>
<td>4.39, 9.14</td>
</tr>
<tr>
<td>LOS &gt;12 hours</td>
<td>(reference)</td>
<td></td>
</tr>
<tr>
<td>Weekend (vs. Weekday)</td>
<td>0.59</td>
<td>0.48, 0.73</td>
</tr>
</tbody>
</table>

Background: As computerized physician order entry (CPOE) becomes more ubiquitous, emergency departments (EDs) are searching for novel ways to unburden their physicians from spending time sitting in front of the computer. To overcome the loss in productivity after CPOE initiation at our institution, we conducted a pilot program using scribes in the ED. Scribes liberate much of the clerical work now required of emergency physicians (EPs).

Objectives: To evaluate whether this relief provides a long-term financially favorable opportunity.

Methods: We conducted a before and after study of EP productivity at our 320 bed suburban community hospital with an ED census of 70,000 annual visits. The before cohort was comprised of productivity data from December 1, 2009 to January 31, 2010. After a 3.5 month washout period, productivity data collected from May 15, 2010 to July 15, 2010 comprised the after cohort. Our primary outcome measure was the annualized net revenue (ANR) of the ED scribe program. The ANR includes the cost savings acquired by increasing the number of patients seen per hour and the increased charges captured per chart between cohorts minus the annualized expense for the scribes. Data were analyzed using descriptive statistics. This study was IRB-exempt.

Results: Productivity data from a total of 11,729 patients in the before cohort were compared with 12,609 patients in the after cohort. In the before cohort, the EPs evaluated 1.83 patients/hour, compared with 2.1 patients/hour when working with scribes. The increase of 0.27 patients/hour, translated to 26.7 extra patients examined per day. To evaluate 26.7 extra patients per day would require 1.62 extra EP shifts per day, or 3.25 EPs per year, providing a cost savings of $934,495. The net revenue per chart was $180 without scribes; this increased to $200 per chart with scribes. This $12 per chart annualized over 70,000 visits represents an additional $840,000 dollars in net revenue. The annualized cost of the scribe program would be $697,995. The ANR of the ED scribe program would provide $1,076,500 additional revenue annually.

Conclusion: In the community hospital setting, an ED scribe program increases emergency physician productivity by increasing the number of patients seen per hour and the revenue captured per patient chart.

Background: Cardiac specific troponin assays often affect medical decision-making on patient disposition in the emergency department (ED), and it has been shown that implementing point-of-care assays can reduce turnaround time for this critical test.
518 Reasons Why Primary Care Providers Refer Patients to Emergency Departments

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Background: Emergency department (ED) volume in the United States is increasing annually and many EDs report overcrowding as a major issue. Published estimates suggest that 20 to 40% of ED patients are referred there by their primary care providers (PCPs). Why PCPs refer patients to EDs remains unclear.

Objectives: We hypothesized that PCPs who refer patients to EDs do so primarily because they lack the resources in their practice setting to deal with many acute onset problems. Our objective was to learn the reasons why PCPs refer patients to EDs.

Methods: We performed a cross-sectional study of PCPs practicing in an urban AMC in the summer of 2009. To address possible selection bias, we surveyed ALL primary care providers caring for patients who had sought care in our ED at least once over the last one year. They were asked to complete a 10 item web-based survey consisting of eight closed-ended and two open-ended responses. We estimated that we would require 150 responses to create width of the 95% confidence intervals of 8% around point estimates. In the admitted patients subgroup, there was a 30 minute reduction in median time to admission order entry. Prior to performing the analysis, it was predetermined that a 30 minute reduction in median ED LOS was clinically significant, and in prior subgroups this change was exceeded.

Conclusion: The reduction in turnaround time translated to decreased ED LOS in patients requiring a cardiac specific troponin assay, and the reduced ED LOS is attributed to the importance of the outcome of this test in determining patient disposition. This conclusion is supported by a reduction in ED LOS in both admitted and discharged patient subgroups.

519 CK-MB Index Should Be Eliminated In Patients With Indeterminate Troponins In the Emergency Department

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Background: Alterations in serum biomarkers CK-MB and troponin (Tr) have been used to evaluate for acute myocardial infarction (AMI) in the emergency department (ED). Studies have shown CK-MB adds no additional information in the setting of a negative Tr, and CK-MB can safely be eliminated in these patients. Many patients have indeterminate Tr caused by renal failure or other comorbidities.

Objectives: To determine whether CK-MB index(CK-MBi) is useful in the evaluation of AMI in patients with indeterminate Tr.

Methods: A retrospective cohort study was conducted of patients with Tr TRoche and CK-MB testing at an urban academic ED with over 55,000 annual visits. Patients with Tr in the ED were identified over 12 months and corresponding CK-MBi examined identifying patients with indeterminate Tr (0.01–0.09) and positive CK-MBi (≥0.1). Further cardiac enzymes and hospital course were evaluated. 95% confidence intervals around point estimates were used in data analysis.

Results: 11,718 initial Tr were identified with 97.9% associated CK-MBs sent. 2512 indeterminate Tr were seen. Of these 28 had positive CK-MBi. Four ruled in for AMI by rising Tr, were judged by treating physicians to be having AMI, and underwent cardiac catheterization. One had no CAD on catheterization. Twenty-two of 28 did not have further elevation of Tr and were judged not to have AMI despite the elevated initial CK-MBi. Two patients were excluded as they had only one Tr sent. The rate of true positive CK-MBi with indeterminate Tr was 0.16% (95% CI=0.03-0.5%). No patients with CK-MBi that were judged to be true positives would have been missed with serial Tr.

Conclusion: Initial results suggest there are rare cases of AMI where CK-MBi is positive in the setting of indeterminate Tr. However, most patients with indeterminate Tr and positive CK-MBi do not rule in by rising Tr and were not judged to have AMI. In most cases CK-MBi is not positive with indeterminate Tr and when positive more commonly confuses the picture; thus we conclude CK-MBi should be eliminated.

520 Discharge Status Improves Timeliness of Analgesia Administration

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Background: In overcrowded emergency departments (EDs) with boarding patients, often the only means of improving patient flow is by maintaining rapid throughput of patients who can be discharged.

Objectives: To determine whether analgesia administration is more rapid in patients about to be discharged than those in the midst of their medical evaluation.

Methods: A multicenter prospective cohort study was conducted with abdominal pain patients ≥ 18 years who were discharged from the ED. Demographics, triage pain score (0–10), and administration of oral analgesics and intravenous ondansetron laboratory services, and extended urgent care hours. These findings have potential implications for ED overcrowding.

Conclusion: Analgesia administration is more rapid in patients about to be discharged than those in the midst of their medical evaluation.
were recorded. Intravenous narcotics were excluded due to protocols requiring patient observation post administration. Time from analgesia order to completion of order and discharge time were obtained via the electronic medical record. Medication orders were categorized into two groups: those within 1 hour of patient discharge (1 HR) and orders placed >1 hour of discharge (>1 HR). Times are presented as medians and compared with Wilcoxon rank sum test.

Results: Of 829 patients, 329 (40%) received an oral analgesic or ondansetron. The mean age of patients was 37 ±14 years and 245 (75%) were female. Mean triage pain score was 7.7 ±2.4. There were 138 medication orders within 1 hr of discharge and 236 medication orders >1 HR. Patients received the following: acetaminophen (n=38); ibuprofen (n=61); acetaminophen with oxycodone or codeine (n=107); a GI cocktail (n=74); and ondansetron (n=94). Time from order to administration was as follows: acetaminophen 10 min (≤1 HR) vs 14 min (>1 HR), p=0.07; ibuprofen 10 min (≤1 HR) vs 21 min (>1 HR), p=0.006; acetaminophen with oxycodone or codeine 13 min (≤1 HR) vs 22 min (>1 HR), p=0.02; GI cocktail 15 min (≤1 HR) vs 23 min (> 1 HR), p=0.07; ondansetron 10 min (≤1 HR) vs 20 min (>1 HR), p=0.03.

Conclusion: In ED abdominal pain patients, over one-third of medications were given within one hour of discharge, with timeliness of ibuprofen, acetaminophen with oxycodone or codeine, and ondansetron administration significantly influenced by impending discharge status.

521 Patient Attitudes Toward a Wait Time Display in the Emergency Department Waiting Room
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Background: With the problems of emergency department (ED) crowding, EDs across the country struggle to keep waiting room patients from leaving without being seen (LWBS). Patients may LWBS if they feel they have not been seen in a timely manner. Initiatives to decrease door-to-provider time, such as physician-triage, are now emerging. A new approach is to provide an estimated wait-time for patients with a “time tracker.” This can vary from a wait-time display in the waiting room, to a banner on the hospital website. Business establishments often post waiting times for people waiting in line for service; however, it is not clear whether this strategy would be viewed positively among patients waiting for emergency care. Some may find it welcoming to know their estimated wait time, while others may view a time tracker negatively and suggestive that the medical problem is minor. Patient preference toward a time tracker is an area for exploration.

Objectives: We assessed patients’ attitudes toward a time tracker display in the ED waiting room.

Methods: The study was an IRB-approved cross-sectional, survey-based sampling of 375 patients from February-July 2010 at an urban, academic center. Patients were systematically approached by a research assistant, and asked to complete an anonymous survey-based sampling of 375 patients from February-July 2010 at an urban, academic center. Patients were systematically approached by a research assistant, and asked to complete an anonymous survey.

Results: Of the 375 patients eligible for participation, 340 (91%) consented to complete the questionnaire. Of those, 214 (63%) indicated that they would prefer an ED with a time tracker. 53 (16%) were unsure, and 72 (21%) would not prefer an ED with a time tracker. Associations between desiring an ED with a time tracker and various factors are shown in the Table. Patients with lower acuity and less severe symptoms were more likely to favor a waiting room time tracker.

Conclusion: A time tracker displaying the estimated wait-time is generally preferred by patients. Lower acuity level and lower perceived symptom severity are directly related to preference for a time-tracker.
and during weekends. Total patient volume and admitted patient volume were not associated with changes in LOS.

523 A Qualitative Analysis of Themes and Threats to Safety Revealed Using High-fidelity Simulation Prior to Utilization of a New Care Space

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Background: In-situ simulation is a tool available to quality and safety experts to identify barriers to optimal care and improve reliability in operational systems. This study used qualitative research methods and in-situ simulation in a new patient care area prior to utilization for patient care to reveal potential threats to patient safety.

Objectives: We hypothesized that analysis of a diagnostic in-situ simulation and subsequent debriefing sessions using a qualitative approach would identify themes pertinent to patient safety prior to opening of a new patient care space.

Methods: In this IRB-approved study, we created a panel of nine simultaneous cases involving patient actors and high-fidelity simulators to expose potential threats to patient safety and/or systemic inefficiencies. Twenty-one participants in three independent multidisciplinary teams (one attending and two resident physicians, three nurses, and a patient care tech) participated in a 2-hour scenario providing care to a panel of simulated patients. The transcriptions of the debriefing sessions were coded using qualitative methods to identify major themes related to patient safety.

Results: The following themes were identified in all debriefings. Lack of familiarity in the patient care space was manifested as 34 (45.95%) separate instances regarding equipment location and orientation to new equipment. The second prevailing theme identified 22 (29.73%) instances specific to communication. Participants commented the new larger space could result in difficulty finding other members of the care team, responding to phone calls, and obtaining assistance for critical situations. A third theme identified 11 (14.86%) concerns of transporting patients to and from the new care space. Finally, staffing concerns were addressed in seven (9.46%) instances.

Conclusion: This qualitative approach of analyzing the observations from an in-situ simulation is a novel and safety-conscious approach to determine latent or unanticipated threats to patient safety in a newly-constructed patient care space. The main themes could have all posed significant threats to patient safety. A result of this study, latent threats were identified and solutions implemented including the addition of a wireless phone system to improve communication. A similar approach could be implemented in other care spaces nearing completion to improve patient safety.

524 Triage Nurse Prediction of Hospital Admission

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Background: Optimizing patient flow in the emergency department (ED) is enhanced by numerous factors. ED patients waiting for in-patient beds diminish flow. It currently takes approximately 5 hours from triage to request for an in-patient bed in our ED. Knowledge of patients requiring admission early in their ED evaluation could speed up the process of securing a bed.

Objectives: The objective of this study is to determine if an ED triage nurse (TRN) can determine if a patient, at triage, will be admitted to an in-patient unit. A secondary objective is to measure the confidence of the TRN prediction.

Methods: A prospective study was conducted during a 4 week period in 2010 in a community hospital ED seeing 76,000 patients per year. Experienced TRNs were trained in the evaluation tool. Immediately after the initial TRN evaluation, a determination was made in writing by the TRN regarding the likelihood of hospital admission and level of confidence in this decision. Patients who did not enter the ED through triage (ambulance) or were under 18 years of age were excluded.

Results: Triage encountered 3,514 patients. 1,866 triaged patients were eligible for the study and 1,164 (62%) were enrolled. Twenty-five subjects were excluded for missing data, resulting in 1,139 subjects. Missed subjects had the same baseline characteristics. There were 287 (25.1%) hospital admissions. TRNs predicted 217 admissions, with a sensitivity of 76% (95% CI 71.3–79.5) and a specificity of 84.5% (95% CI 83.1–85.8). The TRN reported being extremely confident in the prediction 50.1% of the time. In these cases, the TRN demonstrated an admission sensitivity of 81.6% (95% CI 76.5–85.8) and specificity of 93.1% (95% CI 91.8–94.3).

Conclusion: The TRN demonstrated a high sensitivity and specificity in admission prediction at triage, and could potentially save many hours in requesting an in-patient bed. This could result in a more rapid ED through-put and decreased ED boarding.

525 How Long Are Patients Willing to Wait Before Leaving the Emergency Department Without Being Seen?

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1UMMC, Baltimore, MD; 2Baltimore VA, UMBC, Baltimore, MD

Background: There are 120,000,000 patients who seek emergency services annually in the United States. Emergency departments (EDs) across the country strive to serve these patients in a timely manner, despite the current issues of crowding and inpatient boarding. Unfortunately, this is not always achievable, and some patients may choose to leave without being seen (LWBS) as a result. The duration of wait-time beyond which most patients may leave the waiting room, refusing to wait any longer to be seen by an ED provider, is an area for exploration.

Objectives: To determine how long patients are willing to wait to see a provider, and what factors may affect this.

Methods: The study was an IRB-approved cross-sectional, survey-based sampling of 375 patients during February-July 2010 at an urban, academic center. The volume of the academic center is approximately 60,000 per year. Patients were systematically approached by a research assistant, and asked to complete an anonymous questionnaire. Participants were approached between the ages of 18–89 years of age. Patients were excluded if they were brought immediately to the treatment area because of illness severity. Variables such as age, sex, patient-perceived symptom severity, nurse-assessed acuity, employment, and insurance status were analyzed. We calculated descriptive statistics, and performed contingency table analysis of predictor variables. We used logistic regression to adjust for confounding.

Results: Of the 375 patients who were eligible for participation, 339 (90%) consented to complete the questionnaire and indicated the time they were willing to wait. Of these, 171 (50%) indicated a willingness to wait 2 hours or more. The Table demonstrates the
Factors that were associated with willingness to wait. Certain factors such as race, insurance status, employment status, and patient-rated symptom severity were not related to willingness to wait.

Conclusion: Half of the patients surveyed would be willing to wait longer than 2 hours to be seen by an ED provider. Factors associated with a willingness to wait include higher acuity level, age > 25 years, and preference for this ED.

Table

<table>
<thead>
<tr>
<th>Factor</th>
<th>Adjusted Odds Ratios [95% CI]</th>
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<tr>
<td>Age ≥ 25 years</td>
<td>2.5 [1.4 – 4.5]</td>
<td>0.003</td>
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<tr>
<td>High acuity</td>
<td>1.7 [1.0 – 2.6]</td>
<td>0.03</td>
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<tr>
<td>Wait ≥ 30 minutes</td>
<td>1.6 [1.0 – 2.6]</td>
<td>0.03</td>
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<tr>
<td>Preference for this ED</td>
<td>1.9 [1.2 – 3.0]</td>
<td>0.004</td>
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526 The Emergency Severity Index Is the Most Commonly Used Triage System in the United States
Megan McHugh1, Paula Tanabe2, Rahul Khare2, and Mark McClelland3
1Health Research & Educational Trust, Chicago, IL; 2Northwestern University, Chicago, IL; 3George Washington University, Washington, DC, DC

Background: In 2003, the boards of the Emergency Nurses Association and American College of Emergency Physicians approved a joint statement supporting hospital adoption of a reliable, valid five-level triage scale, such as the Emergency Severity Index (ESI). Still, there appears to be considerable variation in use of triage acuity systems in the U.S., with many hospitals using three- and four-level systems that have not been validated.

Objectives: The purpose of this effort was to identify the use of various triage acuity systems in the U.S.

Methods: Data were obtained from the 2009 American Hospital Association Annual Survey, which was mailed to all hospitals in the United States and its territories, and has an annual response rate of approximately 85%. In 2009, a question was added to the survey about hospital use of triage systems in emergency departments (ED). Of the 4,017 general medical and surgical hospitals (adult and children’s hospitals) that reported having an ED, 3,066 (76%) used the five-level ESI. Of the 4,017 general medical and surgical hospitals, 3,066 (76%) use a five-level system other than ESI (e.g., Canadian Triage Acuity System, Australasian). Large hospitals were more likely to use five-level triage systems than other hospitals.

Results: We found that 56.5% of hospitals use the five-level ESI, 25.2% use a three-level triage system, 9.5% use a four-level system, and 6.3% use a five-level system other than ESI (e.g., Canadian Triage Acuity System, Australasian). Large hospitals were more likely to use five-level triage systems than other hospitals.

Conclusion: The five-level ESI triage system is the most frequently used triage system in the United States. Most ED visits in the United States are made to facilities using validated, reliable five-level triage systems.

527 Cardiology Clinic Follow-up Did Not Decrease Return Visits to the ED for Chest Pain Patients
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Background: To decrease admissions and repeat emergency department (ED) visits, we initiated a program to rapidly rule out myocardial infarction (MI) and make an appointment with a cardiologist within 72 hours for low-risk chest pain patients.

Objectives: To determine if there was a decreased rate of return ED visits or hospitalization in patients who kept their appointments, and to evaluate demographic factors that affected clinic no-show rates.

Methods: Safety-net facility with an emergency medicine (EM) residency program and 65,000 adult patient visits per year. Retrospective review of chest pain patients discharged from the ED with a scheduled cardiology appointment between 10/2008 and 12/2009. We compared those who kept their clinic appointment with those who did not for repeat ED visits and admissions for 6 months following the study period. Multivariate analysis evaluated the demographic factors associated with keeping appointments. Diagnostic cardiac testing was defined as echocardiogram, stress test, PCI, or Holter monitor.

Results: Two hundred and sixty-five of 384 (69%) scheduled patients kept their appointments. Show rates did not differ based on age, sex, race or language. Patients with commercial insurance were more likely to keep appointments than Medicare, Medicaid, and uninsured patients (OR= 2.59, 95% CI= 2.54 – 1137, p=0.000). The 119 no-show patients averaged 0.91 return ED visits (95% CI= 2.33 – 1.59) and the 265 patients who kept their appointments averaged 0.28 (95% CI 0.17 – 0.39), which was not statistically significant (p=0.077). Two hundred and twenty-nine patients seen by a cardiologist had no return ED visits; 36 patients had 74 return ED visits. Of those 36, there was no difference in return ED visits between 18 who had diagnostic cardiac testing (mean=2.53, 95% CI=1.60 – 3.06) and 18 who did not (mean=1.78 CI=1.20 – 2.36) (p=0.251).

Conclusion: Keeping a cardiology clinic appointment did not reduce ED visits or admissions whether a test was performed or not. Patients with insurance were more likely to keep clinic follow-up appointments even though there was no co-pay for the visit.

528 A Comprehensive Assessment of Consultation Impact on Emergency Department Crowding
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Background: Requests for specialty consultation are common for emergency department (ED) patients and often contribute to delays in throughput and increased crowding.

Objectives: Our objectives were to (1) determine the extent to which the consultation process contributes to total ED length of stay (LOS); (2) quantify in terms of responsiveness and disposition decision-making attributes of consulting services, and (3) examine for the causes of consultation delay.

Methods: We conducted a prospective cross-sectional study collecting data during a representative sample of shifts at three Canadian tertiary care centers where consultation is a prerequisite for admission. ED patients over the age of 18 with a high acuity score (Canadian Triage Acuity Scale level 1–3) were enrolled if a medical or surgical consultation was requested. We defined total consultation time (TCT) as the interval from consultation request to disposition decision, consult response time (CRT) from consult request to consultant arrival, and decision-making efficiency (DME) from arrival to disposition decision reached. The consultation impact index (CII) was defined as the percent of total ED LOS consumed by the TCT. When CRT exceeded a 1 hour benchmark or DME exceeded 2 hours, the reasons for delay were determined from the consulting service.

Results: For 313 enrolled patients, the median TCT time was 139 min (IQR 87 to 279) with a CII of 18% of the total median ED LOS (778 min, IQR: 485 to 1274). Median CRT was 55 min (IQR 21 to 119) and median DME was 57 min (IQR = 25 to 128). Two hundred and eighteen patients (69%) exceeded either the CRT (64%) or DME (36%) benchmarks and 17% exceeded both. Major contributors to consultation delay included urgent ward issues (23%), multiple ED consults (22%), and need for additional laboratory or radiographic investigations (17%).
Conclusion: The consultation process is highly variable and has an important impact on ED LOS. We describe novel measures related to consultation performance, as well as an analysis of what causes delays. These results can be used to provide feedback to consulting services and for institutional benchmarking.

529 Emergency Department Policies and Protocols for the Evaluation and Treatment of Pediatric Pain in a Rural State
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Background: Pediatric pain in the emergency department (ED) continues to be inadequately treated. Pain management protocols and standing orders have been found to be very effective in improving ED analgesic administration and standardizing treatment techniques. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has set pain assessment and management standards for which compliance by their accredited hospitals is monitored.

Objectives: This study was performed to identify and characterize ED policies for evaluation and treatment of children’s pain in hospitals of different sizes.

Methods: Emergency department nurse managers in Iowa were asked to provide all ED or hospital policies and procedures including any protocols and standing orders related to the evaluation and treatment of pediatric pain in their EDs. Submitted material was evaluated and categorized.

Results: All 118 EDs in Iowa participated. Eighty-four (71%) reported that they had no pediatric pain management protocols, or submitted policies that did not pertain to pain treatment in children. Only eight hospitals (7%) submitted materials reflecting ED standing orders for pediatric pain management. Urban hospitals (72.7%) were more likely (P<0.001) to report having policies than rural/rural referral (21.4 %) and critical access hospitals (18.3%). EDs that reported having pediatric pain management guidelines were more likely (P<0.001) to be from hospitals that were JCAHO-accredited (24/37, 64.9%) than hospitals that were not (10/81, 12.3%). ED specific protocols/guidelines were received from 16 of the 29 hospitals that submitted materials. These protocols most commonly addressed pain assessment, documentation, and treatment. Pain prevention methods were essentially not addressed.

Conclusion: Most EDs in Iowa do not have protocols/guidelines or standing orders that direct pediatric pain assessment and management, particularly in smaller rural hospitals and those that are not JCAHO-accredited. Such hospitals may benefit from assistance in establishing these practices including being provided sample protocols and education prior to and during implementation. All hospital accrediting organizations should be encouraged to include pain management standards as part of their accreditation.

530 Educational Interventions Are Ineffective in Eliminating CK-MB From the Evaluation of Chest Pain in the Emergency Department
Kathryn Volz, Daniel McGillicuddy, Leon Sanchez, Christopher Fischer, and Gary Horowitz
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Background: Historically, alterations in serum biomarkers CK-MB and troponin (Tr) have been used to evaluate for acute myocardial infarction (MI) in the emergency department (ED). Several studies have shown Tr to be more sensitive and specific than CK-MB in diagnosing acute MI. Further studies have shown Tr plus CK-MB to be no more sensitive than Tr alone and suggest CK-MB can be eliminated from the initial screening of acute coronary syndromes in the ED.

Objectives: determine effects of interventions to decrease unnecessary testing of CK-MB in the evaluation of acute MI in the ED.

Methods: A pre and post cohort study was conducted of patients who had CK-MB and Tr ordered at an urban academic Level 1 trauma center with over 55,000 annual visits. The percentage of associated CK-MB tests ordered with Tr tests in the ED was recorded prior to intervention to establish a baseline. An educational intervention was introduced to physicians to order Tr without CK-MB. Three months later a second intervention that involved removing CK-MB from bedside order entry forms was introduced. During the interventions, the number of CK-MB and Tr tests ordered was recorded in monthly aggregates for comparison to the baseline. Data were analyzed using chi-square tests, and p values are reported.

Results: During the baseline period, 97.2% of patients with Tr testing also received CK-MB testing. Educational interventions resulted in a non-significant decrease to 94.0% (p=0.39) of Tr tests ordered with CK-MB. System-based interventions in combination with education were more effective in decreasing the percentage of patients evaluated with CK-MB and Tr to 34.7 % (p<0.05). Charge for CK-MB testing was $60.

Conclusion: Using simple structured interventions in the ED can reduce CK-MB ordering. Educational programming alone was not effective in significantly decreasing CK-MB testing; however, education plus system-based interventions decreased CK-MB ordering. The reduction in CK-MB tests results in cost savings for patients.

531 The Impact of Patient Call Back on Likelihood to Recommend in an Academic Emergency Department
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Background: Patient satisfaction has become a nearly universal parameter tracked by health care systems and likely influences both patient provider choice and insurer payment. Achieving high patient satisfaction in an academic emergency department (ED) can be a daunting task due to variable volumes and acuity, challenging environments, and overworked staff.

Objectives: To assess the effect of telephone follow-up after discharge from the ED on patient satisfaction.

Methods: Retrospective analysis of Press Ganey patient satisfaction surveys mailed to a random 50% sample of discharged patients. The study involved two academic EDs in a single health care system with a combined annual census of 62,000. In July 2009, a single yes/no question about whether the patient received a call by ED staff after their ED visit was added to the standard Press Ganey survey. All surveys for the period of July 2009 through June 2010 were assessed for self-reported call back (yes/no) and likelihood to recommend. During the study period, patient call back was conducted on an ad hoc basis by nurses, residents, or attending physicians and occurred to provide important ancillary test information or to check on a patient’s condition.

Statistics: Likelihood to recommend was dichotomized into the highest category (very good) and the remaining levels (very poor, poor, fair, good). Chi-square analysis was performed to assess differences in the likelihood to recommend by call back group. Differences in proportion, associated 95% confidence intervals (CI) and p-values are reported.

Results: In the 12 month study period about 25,000 surveys were mailed and a total of 2,250 (9.0%) were returned. Three hundred and forty-seven (15.4%) surveys reported “yes” for the call back question. The percent very good for likely to recommend by call back group. Differences in proportion, associated 95% confidence intervals (CI) and p-values are reported.
Conclusion: In the study institution, ad hoc calls to patients after their ED visit has a profoundly positive effect on their likelihood to recommend.

532 Can Emergency Patients Complete a Self-administered Medication Information Form?

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University of Maryland, Baltimore, MD

Background: Medication information transfer in an emergency setting can be labor-intensive and inaccurate. If a large proportion of emergency patients are able to complete a medication questionnaire while waiting for care, this could increase efficiency.

Objectives: To estimate the proportion of urban emergency patients who are able to complete a self-administered medication questionnaire.

Methods: In this cross-sectional study, we consecutively sampled emergency patients during shifts staffed by research assistants, excluding those in police custody. Shifts were distributed evenly between 8am-12pm, 2pm-6pm, and 6pm-10pm. We created a one-page medication questionnaire including 49 medication terms, categorized by general indications (“blood pressure”, for example). Medications were chosen based on national prescribing data and local patterns. We asked patients to circle any medications they took and write the names of those not on the form in a dedicated area on the bottom of the page. We measured completion time, ease of use, and reasons for not completing the form. We used descriptive statistics and calculated a confidence interval for the proportion completing the form, excluding those who refused to participate in the study.

Results: Research staff approached 354 patients to complete medication forms. Median age was 45 (IQR 29–53), and 179 (51%) were triaged as acuity 3 or higher. Of these, 249 (70%) completed a form; 44 (17%) were too ill, 19 (5%) could not read it, and 25 (7%) refused to participate. Thus, excluding refusals, 249/330 (75%), 95% CI 70–80%) were able to complete the form. The median number of medications was 2 (IQR 1–5, range 2–28), and the write-in option was required in 110 cases (44%). Median form completion time was 73 seconds (53–120, IQR). The form was rated as very easy in 86%, somewhat easy in 10%, and somewhat difficult in 4%. The form was completed by the patient 92% of the time, and by a friend or relative 8% of the time.

Conclusion: Over 70% of patients presenting for emergency care were able to complete a self-administered medication information form.

533 Comparing Admission and Transfer Percentages Using the Emergency Department Benchmarking Alliance Database

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Background: The Emergency Department Benchmarking Alliance (EDBA) consisted of 86 hospitals in 2005, 84 in 2006, 85 in 2007, and 86 in 2008, with emergency departments (EDs) ranging in size from under 25,000 to over 100,000 visits per year. Member hospitals submit operational data to the organization on a yearly basis. The EDBA database contains data representing over 10 million ED visits.

Objectives: To compare ED admission and transfer percentages among EDs of varying volumes, trauma designations, and referral status using data from the EDBA database.

Methods: A retrospective analytic cohort study examining selected data points from the EDBA database was conducted. Data from 2004–2008 were included in this study. EDs were grouped into three categories by volume: <25,000 visits/yr (low volume), 25,000–60,000 visits/yr (medium volume), and >60,000 visits/yr (high volume). ED admission percent, transfer percent, emergency medical services (EMS) arrival admission percent, and percent hospital admissions through the ED were compared among the three groups using analysis of variance (ANOVA). A p-value ≤ 0.05 was considered significant.

Results: Emergency department admission percentage was higher in the high volume EDs than in the medium and low volume EDs (23.2% ± 6.6 vs 18.5% ± 6.9 vs 10.9% ± 10.5, p<0.01). Transfer percentage was lower in the high volume EDs than in the medium and low volume EDs (0.06% ± 0.6 vs 1.3% ± 0.7 vs 2.8 ± 1.7, p<0.01). EMS arrival admission percentage was higher in the high volume EDs than in the medium and low-volume EDs (46.2% ± 5.7 vs 39.8% ± 6.2 vs 36.5 ± 0.5, p<0.01). The percentage of hospital admissions through the ED was significantly lower in the high and medium volume EDs than in the low volume EDs (56.9% ± 10.3 vs 59.9% ± 13.9 vs 67.8% ± 14.2, p<0.01).

Conclusion: Emergency department admission and EMS arrival admission percentage were higher in high volume EDs when compared with medium and low volume EDs. Transfer percentage was lower in high volume EDs when compared to low volume EDs. Possible reasons include increased specialist availability and staff resources at high volume facilities. Interestingly, the percentage of hospital admissions through the ED was highest in the low volume EDs when compared to high volume EDs.

534 Triage Determination of Respiratory Rate Does Not Reliably Suggest Severe Diabetic Ketoacidosis (DKA)

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Background: Tachypnea may result in ESI level 3 triage category patients being uptriaged. Rapid triage of patients benefits from automated measurement of all vital signs except for respiratory rate. Triage-determined respiratory rate is commonly inaccurate and show little variability. It is unclear whether triage-determined respiratory rates may flag the Kussmaul respiratory pattern characteristic of DKA, allowing early identification and care.

Objectives: To evaluate whether triage-determined respiratory rate (RR) flags adult patients presenting with diabetic ketoacidosis (DKA).

Methods: Retrospective analysis of the electronic records of all adult patients presenting to three high-volume emergency departments (EDs) over a 5 year period. RRs and triage acuity were extracted from our ED information systems (EmSTAT), and lab data from SoftLab. Patients were considered to have DKA if they had ketonemia, an elevated glucose, a bicarbonate below 20, and an ED diagnosis of DKA.

Results: Over a 5 year period, 493 distinct individuals had a total of 621 ED visits for DKA, with 427 ED visits with a bicarbonate below 20. In each ED, triage respiratory rates did not reliably distinguish patients presenting with DKA from other adult patients. Individual triage nurses exhibited little variability (interquartile range 2.6) in their documentation of RRs for adult patients, less than the interquartile range of 4.0 for all nurses. Most patients with very low serum bicarbonates had similar RRs when compared to patients with milder acidosis or other adult patients. A significant minority of patients with severe DKA were found to have impressive tachypnea, whereas for DKA patients with a bicarbonate below 10 and 20, the 90th percentile of tachypnea was similar to adults.
Conclusion: Respiratory rate is considered a vital sign and an essential part of routine triage assessments, but demonstrating its value is challenging. Given that tachypnea is the rule in severe DKA, strategies are needed to improve the accuracy of RRs determined in triage.

Background: Hyperkalemia (K > 5.5 mEq/dL) in the presence of hemolysis is often reported in the emergency department (ED). False positives may delay patient care while waiting for repeat potassium levels, increase patient lengths of stay, and create additional costs.

Objectives: We hypothesized that patients with hyperkalemia and hemolysis with a normal creatinine level can safely be discharged from the ED without repeating the potassium, because most of these results are false positives.

Methods: A retrospective review of laboratory data in a large, urban, teaching hospital from October 2005 to April 2010 was conducted to identify all adult patients (age ≥ 18) with an elevated potassium level sent from the ED. Initial potassium, initial creatinine, and hemolysis with a normal creatinine level can safely be discharged from the ED without repeating the potassium, because most of these results are false positives.

Results: There were 1,252 patients with initial hyperkalemia, hemolyzed specimen, and a recorded repeat potassium level. Seven hundred and twenty-eight (58%) of these patients had a normal creatinine, of whom 24 (5%) had repeat hyperkalemia and 427 (95%) had normal repeat potassium level. Tintinalli states that cardiac rhythm changes occur at K>6.5 mEq/dL. Using this upper limit for potassium levels, 451 patients had an initial elevated potassium level sent from the ED. Initial potassium, initial creatinine, and any repeat potassium levels for the same ED visit were reviewed.

Results: There were 1,252 patients with initial hyperkalemia, hemolyzed specimen, and a recorded repeat potassium level. Seven hundred and twenty-eight (58%) of these patients had a normal creatinine (<1.2), of whom 66 (9%) had repeat hyperkalemia and 682 (91%) had a normal repeat potassium level. Tintinalli states that cardiac rhythm changes occur at K>6.5 mEq/dL. Using this upper limit for potassium levels, 451 patients had an initial elevated potassium with normal creatinine, of whom 24 (5%) had repeat hyperkalemia and 427 (95%) had normal repeat potassium level. The limitations of this study include single center, retrospective data.

Conclusion: Our results show that without taking any other factors into account (e.g., chief complaint, past medical history, medications, age, sex), a normal creatinine in a hemolyzed specimen predicted that hyperkalemia was usually a false positive finding. However, the implications of hyperkalemia are serious and we found a true positive rate of 5% severe hyperkalemia. Given our results, we concur with the widespread practice of repeating potassium levels for patients found to have hyperkalemia in the presence of hemolysis even with normal creatinine levels. A prospective study in which all samples have an initial creatinine and all hemolyzed samples are repeated would provide definitive evidence for accepting or terminating this practice.

Background: Fully understanding current-state clinician movement patterns and process times is a critical first step in improving emergency department (ED) performance using LEAN.

Objectives: The aim of this study is to determine the accuracy of three different real-time location system (RTLS) configurations used to track current-state clinician movement patterns and patient encounter times in the ED.

Methods: Five hundred and thirty-seven in-room patient-clinician encounters > 15 seconds long were measured by direct observation and using one of three different real-time location systems: a WiFi signal density based system (WiFi), a four lamp infrared-WiFi density signal combination system (WiFi-4IR), or a 64 lamp infrared based system (64-IR). Overall room level accuracy, defined as a single patient-clinician encounter being registered as a single visit in the correct room, and mean dwell time accuracy (absolute value of direct timed observation minus RTLS measured dwell time) for the three different systems were compared by chi-square and ANOVA, respectively; significance = p < 0.05.

Results: Overall room-level encounter accuracy was 92% using the 64-IR system, which was significantly better than the 80% accuracy of the WiFi-4IR system, which was significantly better than the 30% overall accuracy of the WiFi system. This mimicked the mean dwell time error results which were significantly better in the 64-IR system (15±32 sec) compared to either the WiFi-4IR (22±40 sec) or WiFi (69±56 sec) system. Sources of error by the systems included placement of the clinician in the wrong room, registering a single encounter as two encounters (splitting), and coalescence of two encounters into a single encounter. All of these error types were lowest in the 64-IR system.

Conclusion: The 64 lamp infrared based RTLS was more accurate than either the WiFi or WiFi-4 lamp infrared-based systems and, in the authors' opinion, is adequate for most room-level current-state process time measurements and patient/provider workflow analysis studies.
main ED once they became operational in July of 2007 and August of 2009, respectively. The main ED census records were divided into three distinct time frames. Period A (control) was January 2007 through June 2007. Period B was between July 2007 and July 2009 when one freestanding ED was open. Period C was from August 2009 through June 2010 when both freestanding EDs were open.

Results: The mean monthly patient volume for the main ED was 4709 for period A, but dropped significantly (p<0.01) to 4447 for period B, and again dropped significantly (p<0.01) to 4242 during period C. The combined volume for all three EDs increased throughout the study period. A combined monthly volume increase to 5642 occurred in Period B and increased to 6808 in Period C. A two-factor ANOVA was used to analyze admission rates while adjusting for monthly variation. The adjusted mean admission rate at the main ED for period A was 0.221, which dropped somewhat, though not significantly (p = 0.3505) to 0.213 for period B, and then significantly (p<0.01) to 0.189 for period C.

Conclusion: Opening two freestanding EDs resulted in a decrease in overall volume and admission rates at the main ED. In addition, the opening of these two facilities resulted in an increase in overall ED volume for the health care system.

538 Triage EKG in The Emergency Department: A Revised TIMI Score And EKG Has Limited Reproducibility In Triage Categorization

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Background: Triage was developed for resource management. Obtaining EKGS during the emergency department triage (EDT) process is standard practice. Emergency physicians (EPs) need to read triage EKGS to assure that a STEMi or other life threatening event is not present. Historically, STEMi patients are given low triage categories. The NSTEMi patient cannot be evaluated by using only the EKG for triage categorization and thus is at increased risk of delayed care.

Objectives: Our study measures the combined usage of the Thrombolysis in Myocardial Infarction (TIMI) Score and EKG reading among American Board of Emergency Medicine- (ABEM) certified faculty physicians. We measure the agreement of TIMI scores combined with EKGS for the purpose of comparing triage category assignment between physicians.

Methods: This was a retrospective cross-sectional implicit review. We used data from 100 chest pain patients presenting to EDT in August 2009. The TIMI data sheet and EKG were used to categorize these patients as Emergency Severity Index (ESI) triage system levels 1, 2, or 3 at presentation. The original EKGS and TIMI data sheets were purged of all personal identifiers. They were then reexamined and reinterpreted by five ABEM BC/BE faculty emergency physicians (EPs). A comparison was made to the original prospective triage category assigned and between interpreters. Degree of concordance among physicians was analyzed to determine consistency of EKG and TIMI data sheet usage in aiding the assignment of triage category.

Results: Using a combination of the revised TIMI data sheet and EKG, triage categories were assigned. The Spearman Correlation matrix was used to calculate the correlation coefficient for each reader when compared to both initial and inter-reader interpretaton. A correlation coefficient of >0.70 was considered acceptable. Calculated correlation coefficients ranged from 0.272-0.514 when comparing initial assignment to reexamination. Poor to moderate correlation existed among individual readers.

Conclusion: Our paper presents important information that has not been previously published. The resulted correlation inconsistency was unexpected and concerning. Our paper should be considered hypothesis-stimulating as a more useful method to consistently assign triage categories as needed.

539 C-reactive Protein and Risk of Acute Sepsis

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Background: While ample data describe the course of acute sepsis, few studies characterize the baseline risk of sepsis in healthy individuals.

Objectives: We sought to determine the association between baseline high sensitivity C-reactive protein (hsCRP) and the risk of emergency department presentation with acute sepsis.

Methods: We conducted a population-based cohort study using the 30,239-person REGARDS cohort. We determined baseline characteristics of subjects at study inception, including age, sex, race, tobacco use, comorbidities, education and income, and baseline hsCRP. Trained abstractors dual-reviewed medical records of hospitalizations attributed to a serious infection. Using international definitions, we classified sepsis events as serious infection hospitalizations with ≥2 systemic inflammatory response syndrome criteria on emergency department presentation. Cases were subjects experiencing a sepsis event, and controls were individuals not experiencing a sepsis event. We observed subjects during 2003–2010 from the time of baseline examination to time of sepsis hospitalization, death, or loss to follow-up. Using multivariable Cox regression, we determined the association between elevated baseline hsCRP (≥3.0 mg/dL) and risk of sepsis, adjusted for age, sex, race, tobacco use, history of diabetes, hypertension or dyslipidemia, education, and personal income.

Results: We identified 977 serious infection hospitalizations, including 440 sepsis. Common sepsis infection types included pneumonia (44%), urinary tract infection (16%), bronchitis (13%), intra-abdominal (9%), cellulitis (9%), and other (9%). Median baseline hsCRP was 7.5 mg/dL for those who subsequently developed sepsis and 4.6 mg/dL for those who did not. Elevated baseline hsCRP (≥3.0 mg/dL) was independently associated with risk of sepsis (hazard ratio 1.60, 95% CI 1.31–1.96), adjusted for age (1.63 per decile; 1.45–1.84), male sex (1.12, 0.91–1.39), African American race (0.50, 0.40–0.63), tobacco use (past 1.83, 1.44–2.31, current 2.72; 2.02–3.65), diabetes (1.56; 1.25–1.94), hypertension (1.54; 1.22–1.93), dyslipidemia (1.09; 0.88–1.34), education, and personal income.

Conclusion: Elevated baseline hsCRP in healthy persons is associated with subsequent risk of acute sepsis. hsCRP may help to identify individuals at heightened risk of acute sepsis.

540 Effect of Passive Lower Limb Elevation on Internal Jugular Vein Cross-sectional Area in Awake Patients: A Prospective Observational Study

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Background: Several manoeuvres to increase the internal jugular vein cross-sectional area (IJV-CSA) in order to aid cannulation have been described in the literature. Most of these studies have either been done on healthy volunteers or have a small sample size. Our study furthers these descriptions and is the first large prospective study of the effect of passive lower leg elevation (PLE) on IJV-CSA in patients scheduled to undergo surgery.

Objectives: To study the effect of PLE on IJV CSA in patients undergoing surgery.

Methods: After ethics approval and with informed consent, 45 adult American Society of Anesthesiology (ASA) I-III patients scheduled to undergo elective or emergency surgery were selected. Prior to induction of anaesthesia, the right IJV cross-section view was visualized (at the level of the cricoid with the head
rotated 15 degrees to the left) using ultrasound by a single experienced operator, with the patient in the following positions: body supine, supine with passive lower limb elevation (PLLE) at 20 degrees and 15 degree Trendelenburg position (TP). A 60 seconds time interval was allowed to elapse after change in each position before an image was stored. The stored images were arranged in a random order and analyzed by a separate blinded observer. The IJV CSA was determined by the ultrasound’s planimetry software. The patient was then asked to choose between PLLE and TP based on comfort. Discrete variables were analyzed using the chi-square test, while a t-test was used to analyze continuous variables. A p-value of <0.05 was taken to be significant.

Results: A total of 45 ASA I-III patients were recruited (25 men, 20 women). Mean supine IJV CSA (1.14 cm² SD +/- 0.71) increased in both 15 degree TP and 20 degree PLLE (1.39 cm² SD +/- 0.7 and 1.35 cm² SD +/- 0.75, respectively). There was no significant difference in IJV CSA between TP and PLLE (p>0.05). Ninety-three percent of the patients preferred the PLLE position to TP based on comfort.

Conclusion: PLLE is a possible alternative to TP as a manoeuvre to aid IJV cannulation in patients where TP is not possible or hazardous. Moreover, PLLE is preferred over TP by most.

(Figure 1. Internal jugular vein cross-section area, in cm²)

541 Multi-center Observational Study of Resuscitation Practices and Incidence of Disease Progression in the Pre-shock Sepsis Population-phase I
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Background: Sepsis patients with moderately impaired perfusion (elevated serum lactate 2.0 - 3.9 or transient hypotension) who are not in overt shock are at increased risk for disease progression and increased mortality (the pre-shock population). There is no standard care for this at-risk group of patients.

Objectives: The objective of this study was to evaluate 1) the incidence of disease progression in the pre-shock sepsis population and 2) the association of fluid resuscitation with the occurrence of organ failure and death.

Methods: Prospective, observational study in four urban university emergency departments (EDs) of adult (age >17y) patients with 1) a serum lactate 2.0 - 3.9 mmol/L; 2) hospital admission for suspected or confirmed infection; and 3) no evidence of overt shock (SBP<90 after fluid challenge). Intravenous fluid therapy was monitored for 4 hours while in the ED and the subjects were then followed for the development of the composite outcome of 1) in-hospital mortality, 2) use of vasopressors, 3) mechanical ventilation, or 4) increasing organ dysfunction over 72 hours (SOFA increase ≥ 1). Fluid volume delivery was delineated between those receiving a minimum of 20 mL/kg over a 4 hour time window.

Statistics: t-test and z-statistic.

Results: There were 100 patients enrolled. The composite outcome occurred in 35 of 100 (35%). Subjects meeting the composite outcome had similar profiles to those not meeting outcomes: age 59 (16) vs 56 (14) (p=0.33), lactate 2.65 (0.63) vs. 2.50 (0.74) (p=0.31). Patients meeting outcome had a higher 0 hour SOFA score: 2.49 (1.57) vs 1.18 (1.51) (p=0.001). Receiving a minimum of 20 mL/kg over 4 hours in 40% of the cohort and was not associated with a change in outcome compared to receiving <20 mL/kg; 16/40 (40%) vs 19/60 (32%) (p=0.54).

Conclusion: The pre-shock patient population has a large occurrence of disease progression. Intravenous fluid resuscitation is given at relatively low volumes compared to previous studies in the septic shock population. There was no associated change in the outcome associated with low volume fluid resuscitation.

542 Mechanical Ventilation in the Emergency Department: A Prospective Observational Pilot Study
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Background: Protracted emergency department (ED) length of stay (LOS) for critically ill patients requiring mechanical ventilation has important safety implications arising from ED organizational characteristics. The Canadian Association of Emergency Physicians recommends ED LOS not to exceed 6 hours in 95% of cases for Canadian Triage Acuity Scale Levels 1 - 3.

Objectives: To describe mechanical ventilation patterns and patient outcomes (LOS and vital status at discharge) in a cohort of patients receiving mechanical ventilation (invasive [IMV] and non-invasive [NIV]) in the ED.

Methods: We conducted a six-month prospective observational study of mechanical ventilation utilization in four metropolitan EDs. Patients were identified by the treating respiratory therapist and a two-page encounter form collected demographic, ventilation, and outcome data.

Results: Data were recorded on 618 patients: 484 (78.3%) received IMV only, 118 (19.1%) received NIV only, and 16 received both IMV and NIV. The median age was 64 (interquartile range [IQR] 46–78) years, and 379 (61.3%) were male. The three most frequent reasons for IMV were traumatic head injury (123/618, 25.4%), primary neurologic disorder (80/618, 16.5%), and cardiac/respiratory arrest (61/618, 12.6%); for NIV (and both NIV and IMV) were congestive heart failure (45/118, 38.1%; 4/16, 25.0%), chronic obstructive pulmonary disease (35/118, 29.7%; 4/16, 25.0%) and acute respiratory failure (19/118, 16.1%; 2/16, 12.5%). Median ED LOS was 4.5 (IQR 2.2–9.6) hours for all patients requiring IMV; 6.2 (3.2–12.6) hours excluding trauma presentations. Median ED LOS was >6 hours for 195/484 (40.3%), 99/118 (83.9%), and 13/16 (81.3%)
patients receiving, IMV, NIV or both, respectively (P<0.0001). Time to intubation for the 319 (65.9%) patients intubated in a participating ED was 44 (19.5–160.5) minutes. Discharge outcomes were: 41/618 (6.6%) died, 394/618 (63.8%) ICU or other special care unit, 45/618 (7.3) operating room, 87/618 (14.1%) floor, 36/618 (5.8%) another hospital, and 15 (2.4%) home.

Conclusion: Patients receiving NIV were more likely to have a protracted ED LOS and ED LOS >6 hours was common for patients requiring IMV.

543 Experiences and Expectations: Debriefing After Cardiac Arrest Among Emergency Medicine Providers
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Background: Critical event review or debriefing has been used in a multitude of other industries to improve future performance. Debriefing is recommended by the 2010 American Heart Association (AHA) Guidelines as a feedback strategy following cardiac arrest to improve performance of and adherence to advanced cardiac life support (ACLS) algorithms. While there is evidence of the effectiveness of debriefing following cardiac arrest, there is little to describe its prevalence and provider perceptions of debriefing.

Objectives: We sought to determine the extent of debriefing after cardiac arrest among emergency medicine (EM) residents and nurses (EM providers), and whether EM providers thought debriefing was valuable.

Methods: We conducted an online survey of EM providers at two urban teaching hospitals between March and July 2010. Participants were queried about frequency, topics, and perception of debriefing after cardiac arrest, as well as the potential value of such debriefing.

Results: Of 274 EM providers surveyed, 78% (60/77) of residents and nurses (EM providers), and whether EM providers thought debriefing was valuable.

Conclusion: Of 274 EM providers surveyed, 78% (60/77) of residents and nurses (EM providers), and whether EM providers thought debriefing was valuable.

545 Total Number of Systemic Inflammatory Response Syndrome Criteria Predicts Critical Illness Among Emergency Department Patients
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Objectives: To determine if the number of systemic inflammatory response syndrome (SIRS) criteria met during triage was independently associated with an increased duration of intensive care or in-hospital death in emergency department (ED) patients admitted to the hospital.

Methods: Study Design and Setting: A retrospective cohort study of ED patients at an urban academic medical center. Data Collection: Standardized chart abstraction was performed on a random sample of adult patients from all ED medical admissions during a 1-year period. We excluded transfers, ED deaths, and primary surgical or psychiatric admissions. Outcome: ≥ 24 hours in the intensive care unit (ICU) or in-hospital death. Patients were stratified into infectious and non-infectious groups, the former defined as having received antibiotics within 48 hours of admission. SIRS criteria was defined as two or more of the following: temperature > 38.0°C; C or < 36.0°C; C; heart rate > 90 per minute; respiratory rate > 20 per minute; or white blood cell count (WBC) > 12,000 or < 4,000/μL. SIRS criteria was calculated from the triage vital signs and the first ED WBC. Multivariable logistic
regression analysis was used to estimate the independent associations of the total number of SIRS criteria and increased ICU length of stay or in-hospital mortality while adjusting for age, sex, and presumed infection. The interaction of presumed infection and total SIRS criteria was tested using p < 0.05.

Results: We included 1205 unique adult patients; 318 (26%) had infectious etiology, 258 (21%) had ICU stays for ≥ 24 hours, and 23 (2%) died during hospitalization. Adjusting for age, sex, and presumed infection, we found that the higher the total number of SIRS criteria, the stronger the association with intensive care duration of greater than 24 hours or in-hospital mortality (see the Table). Age was not independently associated with the outcome. However, male sex and presumed infection were found to be independently associated with the outcome. The interaction of presumed infection and total SIRS criteria was not significant.

Conclusion: In admitted ED patients, the greater the number of SIRS criteria, the higher the odds of increased intensive care duration or in-hospital mortality, independent of age, sex, and presumed infection.

546 Is Massive Transfusion Protocol Reducing the Risk of Coagulation Disorder? A Nested Case-control Study

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Background: In any context, exsanguination, is strongly correlated with morbidity and mortality. Massive transfusion protocols (MTPs) have been created to improve the outcome of trauma patients, but have not been studied outside this context. An association between the use of MTP and decreased morbidity and mortality has been described in a few studies in the trauma literature.

Objectives: Our goal was to evaluate if an MTP is associated with a reduced risk of early coagulopathy in patients requiring more than 10 units of packed red blood cells (pRBC) 24 hours. We conducted a nested case-control study through our blood bank register. We identified all patients receiving more than 10U pRBCs in 24h between January 2004 and August 2010. Coagulopathy cases were defined as an INR > 1.8, PTT > 1.8 x standard, platelets <50,000 or fibrinogen <1 g/L in the first 24h. Multivariate logistic regression analysis and t-tests were performed with 95% confidence interval.

Results: Two hundred and sixty-seven patients received more than 10U pRBC in 24h. Only 41 patients of the 78 protocol activations (52.6%) actually received more than 10U pRBC. Coagulopathy was present in 202 (75.7%) of the patients in the cohort. MTP use was not statistically associated with a reduction in this rate (OR=1.17, CI 95% =0.527–2.603, p=0.695). This was also the case when corrected for the number of transfusions received. Among patients receiving more than 10U pRBCs/24h, those suffering from a coagulopathy received more transfusions than those who did not (mean=15.7 vs 12.17, p < 0.001, difference = 3.47, CI 95%: 2.18–4.77), and those who entered the protocol received more transfusions than those who did not (mean=13.9 vs 19.8, p=0.002, difference = 5.9, CI 95%: 2.21–9.56).

Conclusion: Our population of exsanguinating patients of diverse etiologies has a very high proportion of coagulopathy. Our MTP was not associated with a significant change in the rate of coagulopathy. This may be caused by many reasons: the severe diseases of our patients, more acidosis and hypothermia, an MTP started too late in the process, or the MTP itself. It remains to be proved that an MTP decreases coagulopathy, morbidity, and mortality outside the context of trauma.

Table: Predictive accuracy of SIRS criteria for ICU stay ≥ 24 hours or in-hospital death in admitted ED patients; n = 1205.

<table>
<thead>
<tr>
<th>SIRS criteria</th>
<th>Sn</th>
<th>95% CI</th>
<th>Sp</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>51% (45%, 57%)</td>
<td>67% (64%, 70%)</td>
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</tr>
<tr>
<td>Infectious patients</td>
<td>65% (55%, 74%)</td>
<td>54% (48%, 61%)</td>
<td></td>
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<tr>
<td>Non-infectious patients</td>
<td>42% (35%, 50%)</td>
<td>70% (67%, 73%)</td>
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<td></td>
</tr>
<tr>
<td>ED SIRS</td>
<td>63% (58%, 69%)</td>
<td>58% (54%, 61%)</td>
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<tr>
<td>Infectious patients</td>
<td>77% (68%, 84%)</td>
<td>45% (39%, 52%)</td>
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<tr>
<td>Non-infectious patients</td>
<td>55% (48%, 62%)</td>
<td>61% (58%, 65%)</td>
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Abbreviations: SIRS, systemic inflammatory response syndrome; ICU, intensive care unit; ED, emergency department; Sn, sensitivity; Sp, specificity; CI, confidence interval.
Results: We included 1205 unique adult patients; 318 (26%) had infectious etiology, 258 (21%) had ICU stays for ≥ 24 hours, and 23 (2%) died during hospitalization. Triage-based SIRS had a significantly lower sensitivity (Sn) (51%; 95% CI 45%, 57%) and higher specificity (Sp) (87%, 95% CI 64%, 70%) when compared to ED SIRS (Sn 63%; 95% CI 58%, 69%; Sp 58%; 95% CI 54%, 61%). More patients with infectious SIRS (32%) died or received ≥ 24 hours of intensive care when compared to the non-infectious (19%) group. When comparing Sn and Sp for infectious versus non-infectious groups, both triage-based SIRS and ED SIRS had significantly higher Sn but lower Sp in the infectious group (see the Table).

Conclusion: In admitted ED patients, the sensitivity and specificity of both triage-based and ED SIRS criteria is relatively modest for critical illness or in-hospital death and is different within infectious and non-infectious patients. ED SIRS criteria may have more sensitivity compared to triage-based SIRS criteria, but sacrifices specificity.

Background: Ultrasound guidance has been shown to decrease complication rates and improve success for internal jugular and femoral vein catheterization. There are little data regarding ultrasound (US)-guided infraclavicular subclavian catheterization in an emergency setting.

Objectives: The purpose of this study was to determine if US-guided infraclavicular subclavian catheterization is safer and more efficacious than the traditional landmark method (LM).

Methods: A prospective randomized trial was conducted from April 2004 through June 2009. Cannulation was considered successful if it occurred within three attempts for the resident and attending physician. If neither was successful then the attending physician performed the crossover method. Four primary data endpoints were calculated. These included: (1) success rate of subclavian catheterization for both (a) resident physician and (b) attending physician, (2) number of attempts by each group of providers, (3) complication rate with each method (defined as arterial puncture, pneumothorax, hemothorax, etc.), and 4) time (in seconds) in which the subclavian line was obtained. Prior experience with both the US and traditional LM methods was also recorded.

Results: Eighty-five patients were enrolled in the study. The primary endpoints that were studied showed a statistical difference in the success rate between LM and US groups. The technique of US guidance was more successful in obtaining subclavian catheter placement when compared to the LM method (LM 58.5% vs. US 79.5%; p=0.006). Time to cannulation was significantly greater in the US-guided group compared to traditional methods in the cases of success within three attempts. There was no significant difference between either group with respect to the complication rate.

Conclusion: Ultrasound-guided subclavian vein catheterization was found to be associated with a higher overall success rate and time to successful catheterization compared to the LM method, but showed no significant difference with respect to complication rate.

Background: Boarding of intensive care unit (ICU) patients is common in many emergency departments (EDs). Evidence suggests that the longer ICU patients remain in the ED, the higher the mortality, the specific etiology of which is unclear.

Objectives: The primary objective of this study was to describe the care of ICU patients boarded in the ED using a one-page checklist.

Methods: As part of a quality improvement initiative, a checklist was developed to assess the quality of ED care of ICU patients with an ED length of stay (LOS) of > 4 hours. This was a convenience sample. Checklists were completed by an independent observer during the patient’s ED stay. There was no formal blinding.

Results: Fifty checklists were completed on fifty unique patients. Fifty-seven percent were male and the mean age was 52.3 ± 25.2 years. The mean ED LOS at the time of checklist completion was 11.5 ± 7.8 hours. The diagnosis groups included toxicologic (20%), cardiac (20%), sepsis (20%), metabolic (12%), COPD (6%), cardiac arrest (2%), and other (20%). At the time of checklist completion, the total fluid input and output and delay in the patient’s fluid input over the course of the ED stay could not be determined in 14% and 49% of the cases, respectively. Sixty-three percent of patients were found to need either a lab recheck or electrolyte supplementation and 18% were overused for medica
dation. The median nurse:patient ratio was 1:2.8 (1:2.1, 1:4.8). In multivariate regression analysis, the nurse:patient ratio was significantly associated with not being able to determine a patient’s fluid input over the course of the ED stay (p=0.031).

Conclusion: Intensive care unit patients boarded in the ED appear to have many deficits in their quality of care including undetermined fluid status, medication delays, and laboratory-related oversights. This study has several limitations including a convenience sample, lack of blinding, small size, and lack of outcome data. Further study is required to determine if these deficits are associated with poorer patient outcomes.

Background: Concerning gaps in care quality are associated with poorer patient outcomes.

Objectives: To determine if emergency physician prediction of mortality was associated with in-hospital mortality among emergency department (ED) patients with systemic inflammatory response syndrome (SIRS).

Methods: Study Design and Setting: Prospective, multi-center, cohort study. Three urban, academically based EDs with a combined annual census of approximately 179,000. Population: Adult patients who met two or more SIRS criteria (temperature > 38.9°C; C or < 36.0°C; C, heart rate > 90 per minute, respiratory rate > 20 per minute, and white blood cell count [WBC] > 12,000 or < 4,000/μL) and were admitted to the hospital from the ED. Data Collection: Physician years of experience since medical school, physician prediction of in-hospital mortality within 72 hours (yes/no), and physician predicted probability of in-hospital mortality (0%-100%). Multivariable logistic regression analysis was used to estimate associations between predicted mortality and actual mortality while adjusting for physician experience. Physician prediction of in-hospital mortality within 72 hours and physician predicted probability of in-hospital mortality were modeled separately. The
interactions of experience with prediction were also assessed in each model.

Results: Six hundred and thirty-eight patients were enrolled of whom 42 (7%) died. Six hundred and twenty-five patients had data related to physician prediction of in-hospital mortality within 72 hours of admission. An ROC curve was constructed with an AUC of 0.78 (95% CI 0.70, 0.86). Physician prediction of in-hospital mortality within 72 hours was strongly associated with death (OR 10.0, 95% CI 8.9, 36.0). The level of physician experience was not independently associated with death (OR 1.00, 95% CI 0.49, 2.03). Six hundred and twenty-one patients had data related to physician predicted probability of in-hospital mortality. The AUC was 0.81 (95% CI 0.73, 0.88). Each 10% increase in physician predicted mortality was associated with an increased odds of death (OR 1.6, 95% CI 1.4, 1.8). The level of physician experience was again not independently associated with death (OR 0.85, 95% CI 0.42, 1.72). The interaction of physician experience and physician prediction was also not significant in either model.

Conclusion: Among ED patients with SIRS, physician judgment, regardless of level of experience, is strongly associated with in-hospital mortality.

552 Therapeutic Hypothermia After Out-of-hospital Cardiac Arrest Due to Initial Non-shockable Rhythms
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Background: The 2010 American Heart Association (AHA) advanced life support (ALS) guidelines recommend the use of therapeutic hypothermia (TH) for comatose cardiac arrest survivors after a first recorded rhythm of VF. The benefit of TH following resuscitation from non-VF rhythms is still unproven and may vary among patients who convert to a shockable rhythm (CS) during attempted resuscitation vs. those who were never shockable (NS).

Objectives: To compare mortality rates and neurological outcomes in patients with out-of-hospital cardiac arrest (OHCA) due to a non-shockable initial rhythm by TH status.

Methods: An IRB-approved retrospective analysis of data from the Cardiac Arrest Registry to Enhance Survival (CARES) through 2009. We conducted logistic regression (outcome=in-hospital mortality; good cerebral performance [CP] vs. else) and ordinal logistic regression analyses (outcome=good CP, alive w/cerebral impairment, death). The models adjusted for age, demographics, arrest location, CPR initiators, and other covariates.

Results: Data on 2467 patients with a non-shockable initial rhythm who met inclusion criteria were analyzed. TH was provided to 261 (10.6%). Unadjusted mortality in the TH group (83.9%; 219/261) was higher than the non-TH group (78.5%; 1,731/2,206), p=0.04, though differences by rhythm category were observed. The ordered logistic regression model yielded a proportional odds ratio (OR) for TH of 0.67 (95% CI=0.47–0.96). However, when modeling just those with a CS (n=330), the OR=1.67 (95% CI=0.73–3.84) while a model with NS only (n=2117) gave an OR of 0.54 (95% CI=0.36–0.82). Similar trends were observed in the logistic regression models. For example, with the outcome good CP vs. else, the OR was non-significant overall, but 0.36 (95% CI=0.16–0.81) when an interaction term with rhythm category was used, and 3.98 (95% CI=1.13–13.96) when modeling just CS patients. Limitations: This was a retrospective observational study. TH reporting was optional during the study period and may not have been consistently provided or reported. As of 11/2010, it is a mandated field for all CARES participants, and future analyses are planned.

Conclusion: We found TH to be associated with worse outcomes in this cohort; however, the results were driven by NS patients. The less common CS patients tended to have better neurological outcomes with TH. If future studies confirm this observation, it would suggest that provision of TH to this subgroup might have benefit.
Background: Despite its high prevalence, the influence of diabetes on outcomes of emergency department patients with sepsis remains surprisingly undefined.

Objectives: The aim of this analysis was to investigate the association of diabetes and hyperglycemia with mortality in three temporally and geographically distinct cohorts of patients with suspected infection being admitted to the hospital from the emergency department.

Methods: Three independent, observational, prospective cohorts from two large United States tertiary care centers were studied. We included patients admitted to the hospital from the emergency department with suspected infection. We investigated the association of diabetes and in-hospital mortality stratified by sepsis syndrome (sepsis, severe sepsis), disease severity (using the MEDS score and the SAPS score), and initial glucose range (200 mg/dl). Further analysis was performed through multivariate logistic regression analysis.

Results: A total of 29 separate victim-involved hospital shooting events were included. Wilcoxon two-sample test and Fisher’s exact test were performed. The size of the involved hospital varied from 54 to 924 beds. The majority of incidents (66%) occurred within the hospital proper, with a third occurring in a patient room or patient care area (11% in the ICU specifically). More than 70% occurred in the past five years, with 11 (40%) events identified occurring in 17 states, mostly the east coast.

Conclusion: This is the first description of hospital-related shootings in the United States. Such shootings appear to be rare, random, and not associated with neighborhood violence. Most involve a determined shooter (grudge or ill family member directed), and many occur outside the hospital proper, making targeted preventive security measures difficult.

555 Survival of Apneic Patients? Better Than You Might Assume
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Background: Many disaster triage algorithms such as START, JumpSTART, and SORT suggest classifying patients with apnea as deceased, regardless of any other signs of life. The mortality rate of this group is unknown. Some apneic patients with other signs of life such as a palpable pulse or response to pain may benefit from immediate life saving interventions, and it may be reasonable to attempt resuscitation on these victims if respiratory resources are available.

Objectives: To estimate the mortality rate of pediatric and adult blunt trauma victims with apnea but other signs of life.

Methods: Using the National Trauma Data Bank, data on the following variables were extracted using Access 2007: age (0-8yrs=pediatrics (PEDS), >8yrs= adult), injury type (=blunt), first systolic blood pressure (FSBP), first unassisted respiratory rate (FURR), and motor GCS score (MGCs). Patients given sedatives or paralytics or with missing variables were excluded. Palpable pulse was defined as FSBP>79, and motor signs of life were defined as MGCs>1.

Results: Of the 724905 patients, 20471 (2.8%) had FURR=0, and 10016 (49%) of these apneic patients survived. Of the 1220 apneic PEDS (50% [610/1222] overall survived), 62% (752) had at least a palpable pulse or motor sign, and 71% (535/752) of these survived. Of the 19249 apneic adults (49% [9406] overall survived), 66% (12681) had at least a palpable pulse or motor sign, and 69% (8769) of these survived. The survival rate for apneic PEDS with both a pulse and a motor sign was 89% compared to 82% survival in apneic adults (p=0.004).

Conclusion: Although survival of apneic patients will depend on the availability of some respiratory support, their overall survival (about 50%) is not dismal. More than 80% of apneic adults and almost 90% of apneic PEDS with both a pulse and a motor sign can survive. Depending on the respiratory support resources available during a disaster, it may not be appropriate to always classify all apneic patients as dead.

554 Hospital Shootings in the Last Decade: Can the Data Reveal a Prevention Strategy?
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Background: Violence within hospitals involving firearms is of increasing concern.

Objectives: Following a recent shooting of a Johns Hopkins surgeon by a distraught visitor after learning of his mother’s unfavorable prognosis, we sought to explore these types of events to best advise prevention/mitigation security options.

Methods: Using Google, Netscape, LexisNexis, PubMed, and ScienceDirect, we searched and reviewed newspaper articles on U.S. hospital shootings from January 1, 2000 through September 30, 2010. Search terms included hospital shooting, hospital violence, assaults on healthcare providers, shooting of healthcare workers, guns and hospitals. Only shootings occurring within a hospital or on its premises that involved at least one intended victim were included. Wilcoxon two-sample test and Fisher’s exact test were utilized for analysis.

Results: Twenty-nine separate victim-involved hospital shooting events were identified occurring in 17 states, mostly the east coast. More than 70% occurred in the past five years, with 11 (40%) occurring in the first nine months of 2010 alone. There were 39 victims and 22 deaths, and 1 miss. The size of the involved hospital varied from 54 to 924 beds. The majority of incidents (66%) occurred within the hospital proper, with a third occurring in a patient room or patient care area (11% in the ICU specifically). Another 11% occurred in proximity to, or in, the emergency department. 41% were victims, 70% were health care workers, 31% were relatives of ill patients. Other victims included police/security officers (15%) and visitors (10%). Grudge shootings comprised 60%. Eleven perpetrators (41%) committed suicide following their actions. The vast majority of hospitals were not located within notably violent neighborhoods. Statistical analysis did not reveal any distinct shooter or shooting profiles that would allow targeted security measures.

Conclusion: This is the first description of hospital-related shootings in the United States. Such shootings appear to be rare, random, and not associated with neighborhood violence. Most involve a determined shooter (grudge or ill family member directed), and many occur outside the hospital proper, making targeted preventive security measures difficult.

556 Gender Differences in Characteristics of Youth Seeking Emergency Department Care for Assault-related Injury
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Background: Peer violence is a leading cause of injury and death among teens, and is growing in prevalence among teen girls. However, the relative contributions of potential risk factors for acute peer violent injury (VI) among males v. females have not been defined.

Objectives: To characterize demographic characteristics, previous violence, and risk behaviors among youth presenting to the ED with VI, and compare these characteristics by sex.

Methods: A systematic sample of teens (ages 14–18) presenting to an urban emergency department (ED) with acute VI (excluding
Background: An estimated 5.7 million Americans have undiagnosed diabetes mellitus (DM). Early diagnosis of pre-diabetes is important in preventing DM; early treatment of DM can prevent or delay end-organ damage. The hemoglobin A1c (HbA1c) is a blood test with a rapid turnaround time that has been recommended by the American Diabetes Association (ADA) for the diagnosis of pre-DM and DM. The HbA1c may therefore facilitate the detection of pre-DM and DM in the emergency department (ED).

Objectives: Our objective was to determine the frequency of undiagnosed pre-DM and DM in hyperglycemic patients in the ED using HbA1c testing.

Methods: HbA1c values were obtained from adult patients (≥18 years) presenting to the ED from 10/01/2010 - 11/30/2010 with an ED serum glucose level ≥100 mg/dl and no known history of DM. The study population was derived from a convenience sample of patients seen during the study period. Blood samples were collected as part of patients’ routine evaluations. Excess blood was used to obtain the HbA1c.

Results: During the 36-month study period, 197 patients with acute VI were discharged home (94.2%). The majority reported a history of past-year peer aggression (84.2%) and past-year VI (55.8%). After logistic regression, females (compared to males) were less likely to report living with a parent (OR 0.25, 95% CI 0.08–0.84), and more likely to report depressive symptoms (OR 2.59, 95% CI 1.23–5.48) and past-year dating aggression (OR 2.23, 95% CI 1.04–4.82). Similar rates of past-year peer aggression and violent injury, age, race, socioeconomic status, education, alcohol use, and weapon carriage were observed for males and females.

Conclusion: Male and female adolescents with acute VI were very similar, reporting high rates of past year peer violence, assault-related injury, and substance use. The elevated rates of risk behaviors and previous VI support the ED setting as a location for violence prevention, as well as the need for substance use interventions for male and female adolescents. Such interventions should be tailored to account for unique risk factors among adolescent females, such as depressive symptoms, dating aggression, and independent living status.

557 The Use of HbA1c To Identify Undiagnosed Diabetes and Prediabetes in Adult Emergency Department Patients

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Background: While many studies have identified associations between intimate partner violence (IPV) and high-risk behaviors, limited research has been performed regarding the relationship between IPV and health behaviors.

Objectives: We assessed the correlations between IPV and common health behaviors including seat belt use, smoke alarm in home, handgun access, BMI, diet, and exercise. We hypothesized that IPV victims would be less likely to have healthy behaviors compared to women without IPV.

Methods: All adult female patients who presented to three Atlanta-area emergency department waiting rooms on weekdays from 11 AM to 7 PM were asked to participate in a computer-based survey by trained research assistants. The Universal Violence Prevention Screening Protocol (UVVSP) Screen was used for initial IPV identification, and the Danger Assessment Tool was used to measure abuse severity. The survey also assessed seatbelt use, smoke alarm presence, handgun access, height, weight, exercise, and diet. Subsequent interviews at four weeks and three months determined if victims had contacted IPV-related resources or ended their relationships. We performed chi-square tests to measure associations between variables, and tested the strength of associations using phi coefficients for binary variables and Spearman’s rank correlation coefficients for ordinal variables.

Results: Participants ranged from 18 to 68 years, with a mean of 38 years. Out of 1452 respondents, 155 patients self-identified as white (10.7%), and 1218 as black (83.9%); 153 out of 832 women who were in a relationship in the prior year (18.4%) screened positively for IPV. We found significant relationships between IPV and not wearing a seatbelt (p<0.01), handgun access (p<0.01), and eating unhealthy foods (p<0.01). Victims who scored higher on the Danger Assessment Tool were more likely to have high BMIs (p=0.052) and to exercise more (p=0.003). Contacting IPV-related resources was associated with handgun access, high BMI (p=0.02), and increased exercise. Ending the relationship was associated with having a smoke alarm, handgun access, low to normal BMI, increased exercise, and a healthy diet.

Conclusion: Women experiencing IPV are more likely to exhibit risky behaviors, while those who end their abusive relationships endorse more healthy behaviors.

558 Relationship Between Intimate Partner Violence and Common Health Behaviors

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Background: An estimated 5.7 million Americans have undiagnosed diabetes mellitus (DM). Early diagnosis of pre-diabetes is important in preventing DM; early treatment of DM can prevent or delay end-organ damage. The hemoglobin A1c (HbA1c) is a blood test with a rapid turnaround time that has been recommended by the American Diabetes Association (ADA) for the diagnosis of pre-DM and DM. The HbA1c may therefore facilitate the detection of pre-DM and DM in the emergency department (ED).

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Methods: HbA1c values were obtained from adult patients (≥18 years) presenting to the ED from 10/01/2010 - 11/30/2010 with an ED serum glucose level ≥100 mg/dl and no known history of DM. The study population was derived from a convenience sample of patients seen during the study period. Blood samples were collected as part of patients’ routine evaluations. Excess blood was used to obtain the HbA1c.

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Conclusion: Male and female adolescents with acute VI were very similar, reporting high rates of past year peer violence, assault-related injury, and substance use. The elevated rates of risk behaviors and previous VI support the ED setting as a location for violence prevention, as well as the need for substance use interventions for male and female adolescents. Such interventions should be tailored to account for unique risk factors among adolescent females, such as depressive symptoms, dating aggression, and independent living status.

557 The Use of HbA1c To Identify Undiagnosed Diabetes and Prediabetes in Adult Emergency Department Patients

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Results: A total of 250 patients (mean age 60 ± 20 years; 52% female; 62% hospitalized) were tested. Patients with a glucose of 100–125 mg/dl had a mean HbA1c of 5.7% (n=162); for a glucose of 126–199 mg/dl, mean HbA1c was 5.9% (n=80); for a glucose of ≥200 mg/dl, mean HbA1c was 7.4% (n=8) (p<0.001). Of the 250 patients, 109 patients (44%) had HbA1c values between 5.7% and 6.4% (pre-DM), and 31 patients (12%) had HbA1c values ≥6.5% (DM). Of hospitalized patients, 74 (48%) had pre-DM and 21 (14%) had DM. Of discharged patients, 35 (37%) had pre-DM and 10 (10%) had DM.

Conclusion: Undiagnosed pre-DM and DM are common in adult ED patients with serum glucose levels ≥100 mg/dl. Patients with elevated glucose values should be referred for outpatient DM testing or have an HbA1c measured in the ED for screening diagnosis and subsequent outpatient referral.

558 Relationship Between Intimate Partner Violence and Common Health Behaviors

Anitha Mathew
Emory University, Atlanta, GA

Background: While many studies have identified associations between intimate partner violence (IPV) and high-risk behaviors, limited research has been performed regarding the relationship between IPV and health behaviors.

Objectives: We assessed the correlations between IPV and common health behaviors including seat belt use, smoke alarm in home, handgun access, BMI, diet, and exercise. We hypothesized that IPV victims would be less likely to have healthy behaviors compared to women without IPV.

Methods: All adult female patients who presented to three Atlanta-area emergency department waiting rooms on weekdays from 11 AM to 7 PM were asked to participate in a computer-based survey by trained research assistants. The Universal Violence Prevention Screening Protocol (UVVSP) Screen was used for initial IPV identification, and the Danger Assessment Tool was used to measure abuse severity. The survey also assessed seatbelt use, smoke alarm presence, handgun access, height, weight, exercise, and diet. Subsequent interviews at four weeks and three months determined if victims had contacted IPV-related resources or ended their relationships. We performed chi-square tests to measure associations between variables, and tested the strength of associations using phi coefficients for binary variables and Spearman’s rank correlation coefficients for ordinal variables.

Results: Participants ranged from 18 to 68 years, with a mean of 38 years. Out of 1452 respondents, 155 patients self-identified as white (10.7%), and 1218 as black (83.9%); 153 out of 832 women who were in a relationship in the prior year (18.4%) screened positively for IPV. We found significant relationships between IPV and not wearing a seatbelt (p<0.01), handgun access (p<0.01), and eating unhealthy foods (p<0.01). Victims who scored higher on the Danger Assessment Tool were more likely to have high BMIs (p=0.052) and to exercise more (p=0.003). Contacting IPV-related resources was associated with handgun access, high BMI (p=0.02), and increased exercise. Ending the relationship was associated with having a smoke alarm, handgun access, low to normal BMI, increased exercise, and a healthy diet.

Conclusion: Women experiencing IPV are more likely to exhibit risky behaviors, while those who end their abusive relationships endorse more healthy behaviors.

559 Dating Violence Victimization and Aggression Among High Risk Teens Seeking Ed Care

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Background: Dating violence and its associated risks and protective factors is poorly understood among high risk teens.

Objectives: To characterize the population of high risk teens who endorsed past year dating violence on demographics, risk, and protective factors.
Methods: A systematic sample of teens (age 14–17) were approached as part of a randomized control trial (SafeTeens) to complete a survey using validated measures of risk and protective factors. Teens who were “high risk” (past year alcohol use or peer aggression) completed a survey measuring types of violence, demographics, and potential risk/protective factors. For this analysis, dating violence was categorized into three independent variables: victimization only, aggression only, or both aggression and victimization. Multinomial logistic regression examined correlates of aggression only, or both aggression and victimization (using victimization only as the reference group).

Results: Among high risk teens (n=726), 55 % (n= 397) reported dating violence; 65% female, mean age 16, 63% African American. Specifically, 22% reported victimization only (43 % female), 36% aggression only (75% female), and 42% both aggression and victimization (67% female). Teens reporting both dating victimization and aggression were more likely to be female (OR 3.4, 1.9-6.3), African American (OR 3.5, 1.9-6.5), report alcohol misuse (OR 2.1, 1.1-3.9), illicit drug use (OR 2.0, CI 1.01-3.95), and have a female mentor (OR 2.9, 1.5-5.7). Teens reporting dating aggression only were more likely to be female (OR 3.7, 2.0-6.8), receive public assistance (OR 2.4, 1.3-4.4), have a female mentor (OR 2.2, 1.1-4.2), and were less likely to attend religious services (OR 4.0 0.2-0.7) compared to those reporting only victimization.

Conclusion: High risk teens reporting dating violence note high levels of aggression as well as victimization. Although these data cannot account for self defense, both male and female teens report more aggression than victimization, and identification of a female mentor was positively associated with aggression. More research is needed to understand the complexity of gender and dating violence among these teens and its associated risk factors, including mentorship. In addition, future interventions should explore the positive role of religious affiliation in protection of dating aggression.

560 Patient Preferences for ED-Initiated Smoking Interventions
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Background: An estimated 30–40% of emergency department (ED) patients use tobacco. The ED visit provides an untapped opportunity to initiate interventions for smoking cessation.

Objectives: Our objective was to examine specific patient preferences for receiving ED-initiated smoking cessation interventions.

Methods: We conducted a 10-center, cross-sectional study of ED patients. Eligibility criteria included age ≥ 18, English or Spanish language, and tobacco use within the past 30 days. Participants completed a standardized written survey which included nine hypothetical smoking cessation interventions, ranging from low (brochure) to high-intensity (ED counseling and outpatient treatment). Preference for specific counseling styles ranging from direct advice to individualized feedback was also assessed. Items were ranked on a five-point Likert scale. A standardized chart abstraction tool was used to collect data on ED evaluation and management. Descriptive statistics (means, counts, percentages) were calculated.

Results: Three hundred and seventy-five patients were enrolled. Mean age was 41 years; 43% were male, 20% Hispanic/Latino, and 41% white. Forty-six percent of participants smoked at least one pack of cigarettes per day; 11% had a smoking-related ICD-9 diagnosis. Most (75%, 95% CI 70–79%) participants reported interest in at least one intervention, including relatively intensive treatments such as counseling during the ED visit (33%, 95% CI 28–38%), nicotine replacement (54%, 95% CI 49–50%), and faxed referral to outpatient counseling (37%, 95% CI 32–42%). The counseling styles rated most favorably involved individualized feedback (54%, 95% CI 49–50%), skill-building in avoiding smoking (53%, 95% CI 47–58%), and emphasis on autonomy (53%, 95% CI 48–58%). Smoking history was documented for 87%, but documented counseling by the emergency medical staff was rare (4%). Smoking cessation discharge instructions were provided to 15%, referrals for treatment to 18%, and nicotine replacement to 0.3%.

Conclusion: In this multi-site study, patients reported receptivity to a variety of ED-initiated interventions, though counseling and referrals were infrequently provided. Preferred counseling styles were those consistent with motivational interviewing (MI), supporting the use of MI-based brief interventions for tobacco use in the ED.

561 Reducing Emergency Department Recidivism in Victims of Intentional Penetrating Trauma
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Background: Victims of intentional penetrating trauma have high rates of repeat visits for new intentional injuries. This is believed to be related to engaging in activities with higher likelihood of being assaulted. Prior studies have looked at reducing re-injury by providing social services interventions for admitted patients with intentional injuries.

Objectives: Our study objective was to evaluate whether an emergency department (ED) intervention for all patients presenting with intentional penetrating injuries would decrease future visits for new injuries.

Methods: The study was a retrospective review of ED visits at an urban Level 1 trauma center that is the only adult trauma center in the region. The initial review identified patients seen in the ED for intentional penetrating trauma over a 1 year period with no intervention. This pre-intervention group was matched with same sex, similar age controls seen in the ED for non-injury complaints. The groups were compared over the subsequent 3 years for ED visits for new intentional injuries. A third group of subjects was then identified who presented to the ED with intentional penetrating injuries over a 1 year period. Subjects in this post-intervention group were met in the ED by a representative of the local District Attorney’s Victim Assistance Unit. Records were examined for 1 year following the post-intervention group’s ED visit to identify ED visits for new injuries. The rate of repeat visits was adjusted because of the follow-up time discrepancy between the pre- and post-intervention groups. The adjustment was based upon published literature on rates of recidivism over time in this population. Comparisons between the average number of repeat injury visits for the pre-intervention group and non-injury group and the pre- and post- intervention groups were made by t-tests.

Results: Three hundred and ninety-eight pre-intervention subjects, 398 non-injury subjects, and 368 post-intervention subjects were compared. The adjusted mean return visits per year for intentional injury were 0.12 for the pre-intervention group, 0.02 for the non-injury group, and 0.07 for the post-intervention group. The pre-intervention group had significantly more revisits than the non-injury group (p < 0.001) and the post-intervention group (p = 0.0126).

Conclusion: A brief social services intervention in the ED significantly reduced recidivism rates for victims of intentional penetrating trauma.

562 Emergency Department Visits for Gastroenteritis Before and After Rotavirus Vaccine Implementation
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Background: Rotavirus gastroenteritis (GE) accounts for a significant number of emergency department (ED) visits in children less than 5 years old. The CDC has reported a decrease in rotavirus-positive cultures since the launch of a new oral vaccine for young children in 2006.

Objectives: We sought to determine the magnitude of decrease in ED visits for gastroenteritis since that time in the <5 age group, and also to evaluate any change in the group ≥5 years of age during the same period.

Methods: Design: retrospective cohort of ED visits. Setting: 28 suburban, urban and rural New York and New Jersey EDs with annual visits between 22,000 and 82,000. Population: consecutive patients between 1-1-1996 and 9-30-2010. Protocol: we identified GI visits using ICD-9 codes for GI and diarrhea. For each year, we determined the average daily percent of visits for gastroenteritis within the age <5 years group and the age ≥5 group (GE<5). We used the Student’s t-test (alpha = 0.05) and calculated 95% confidence intervals. We also performed linear regression analysis for GE<5 after 2005 (linear regression analysis r² =0.99, p < 0.0001).

Results: There were 7,069,646 visits for all causes in the database and 724,360 had an age < 5. GE<5y rose from 5.4% in 1995 to a peak of 10.1% in 2005, and then decreased to 6.6% by 2010. There was a 35% (CI 32%-37%, p <0.001) monotonic decrease in GE<5 after 2005 (linear regression analysis r² >0.99, p < 0.0001). GE≥5 rose from 1.8% in 1995 to 2.9% in 2005 and 3.3% in 2010. This represented a 12% (CI 9%-14%) after 2005.

Conclusion: We found a decrease in ED visits for GE in the <5 age group of 35% after the introduction of the rotavirus vaccine. However, there was a large variation in the incidence over the study period, 1996 - 2010. It is therefore unclear to what extent the recent decrease is due to vaccine effect versus other causes. During the same period there was a slight increase in gastroenteritis visits in the age ≥5 group.

564 The 21-only Ordinance Reduced Alcohol-related Adverse Consequences Among College Age Students
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Background: In an effort to reduce underage drinking, Iowa City, IA adopted a 21-only ordinance prohibiting persons under 21 from being in bars after 10 PM. This ordinance went into effect on June 1, 2010. Iowa City is mainly a college town and home of the University of Iowa (UI). The 21-only ordinance took effect. Secondary goals were to measure the effect on underage AR visits since the 21-only ordinance took effect. Secondary goals were to measure the effect on underage alcohol emergencies, student alcohol-related emergencies, sexual assaults, and arrests for public intoxication.

Methods: We performed a two-site (UI Hospital and Mercy Hospital), retrospective cohort study of emergency department patients, ages 18 to 22, presenting for alcohol-related reasons from June 1, 2010 to September 1, 2010 and compared data to the same time period a year earlier. Data were also obtained from UI student records, public arrest data, and sexual assault data. Pearson chi-square analysis compared categorical variables.

Results: There were 1314 visits in 2009 and 1378 visits in 2010. AR visits decreased from 158 in 2009 (12.0%) to 116 in 2010 (8.4%, p<0.01). Underage AR visits decreased by 32% from 88 to 60, UI student visits decreased by 18% from 66 to 54, and non-UI student visits decreased by 33% from 92 to 62. Public intoxication bookings for 18 to 20 year olds decreased from 205 to 112 (54%). Sexual assaults for 18 to 22 year olds decreased from 11 to 8.

Conclusion: The 21-only ordinance was associated with a significant reduction of AR visits. This ordinance was also associated with reduction in underage AR visits, UI student visits, public intoxication bookings, and sexual assaults. These data suggest that other cities should consider a similar ordinance to prevent unwanted consequences of alcohol.
Schedule of Classes and Alcohol-related Emergencies
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Background: Prior research suggested an association between the amount of alcohol consumed on Thursday night and Friday class schedule for college students. In an effort to curb binge drinking on Thursday nights, the University of Iowa (UI) increased the number of Friday classes for the 2008 academic year (intervention) relative to the 2007 academic year (control).

Objectives: To determine whether there was a change in Thursday night alcohol-related emergency visits by UI students since university policy increased the number of Friday classes.

Methods: Data were obtained via retrospective chart review of all UI ED patients, ages 18 to 22, presenting for alcohol-related reasons on Thursday night (6 PM to 6 AM) from the fall 2007 semester through the spring 2009 semester only when classes were in session. A patient was considered to be an alcohol-related emergency if he or she had a positive blood alcohol test, if the medical record indicated alcohol was consumed just prior to arrival, or if he or she was given an alcohol-related diagnosis. Patient name and birth date and university records were used to determine student status.

Results: There were 70 alcohol-related emergencies in the control year and 65 in the intervention year. Student record review indicates 50 students and 20 non-students in the control year and 35 students and 30 non-students in the intervention year. A Pearson chi-square analysis showed a significant reduction in alcohol-related emergencies for UI students as compared to non-students for the intervention year (p<0.05).

Conclusion: An increase in Friday morning classes is associated with a significant decrease in emergency department alcohol-related visits for UI students. University policy can affect college drinking behavior and the emergency department can serve as an objective measure for monitoring university policy.

566 Occupational and Demographic Factors Associated With Violence in the Emergency Department
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Objectives: a) Describe the prevalence of violence against emergency department (ED) health care (HC) workers; b) identify whether demographic and occupational characteristics of ED HC workers are related to violence; and c) identify whether demographic and occupational characteristics are related to feelings of safety and level of confidence when dealing with workplace violence.

Methods: A cross-sectional design was used to collect survey data from 213 direct care providers at six EDs. In addition to demographic and occupational questions, participants responded to questions about their violent experiences, feelings of safety while working in the ED, and their confidence in dealing with workplace violence.

Results: Verbal and physical violence were prevalent in all six EDs. Forty percent (n=86) experienced over 10 episodes of verbal harassment from patients and 17% (n=36) from visitors. Forty-seven percent (n=101) experienced at least one episode of verbal harassment from patients and 20% (n=43) from visitors. Sixty-eight percent (n=144) experienced at least one physical threat from patients and 31% (n=65) from visitors. Forty-eight percent (n=102) experienced at least one physical assault from patients and 2% (n=5) from a visitor. Nine percent (n=16) had been injured by a patient assault during the previous 6 months. There were no statistically significant differences in the prevalence of violence for age, job title, and patient population. Females reported sexual harassment more frequently (p=0.0001). Feelings of safety were related to incidence of violence. Women were significantly more likely to feel unsafe (p<0.001) and have less confidence dealing with violent patients and visitors (p=0.0001). Patient population and hospital location were not related to the incidence of assaults.

Conclusion: The study findings indicate that all HC workers in EDs are at risk of violence, regardless of demographic and occupational characteristics. Feelings of safety are related to job satisfaction and turnover. It is important to identify why women feel more unsafe even though they do not appear to be at greater risk of violence. Violence has serious consequences for the employers, employees, and patients. Employers need to develop prevention strategies to reduce and manage the violence.

Increased Detection of Alcohol Consumption and At-risk Drinking With Computerized Alcohol Screening and Brief Intervention
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Background: Alcohol screening and brief interventions have been shown to decrease alcohol associated morbidity and mortality.

Objectives: Comparison of a brief person-to-person medical screening examination (MSE) to computerized alcohol screening and intervention (CASI) for emergency department patients who consume alcohol, and those who are at-risk for alcohol-related disease.

Methods: Single-institution, retrospective review of CASI/MSE database in an emergency department setting from January 2008 through December 2009. Inclusion criteria included age > 18, and completion of both the MSE and CASI. We analyzed the CASI/MSE database for alcohol use by comparing age, sex, primary language (English, Spanish), and AUDIT scores.

Results: Of the 7,163 patients in the CASI/MSE database, 5,835 were included in the study. Overall, CASI showed an increase in detection of alcohol consumption and at-risk drinking over MSE across all ages, sex, and primary language. According to MSE the percentage of non-drinkers, drinkers not-at-risk, and at-risk drinkers were 75%, 22%, and 2.5% while CASI was 56%, 33%, and 11.5%, respectively. Additionally 9.6% of patients had AUDIT > 8 as compared to the 2.5% of drinkers at-risk determined by MSE. Finally, for patients under the age of 21, the percentage of non-drinkers, drinkers not-at-risk, and drinkers at-risk was 79%, 19%, and 2% for MSE while CASI was 51%, 33%, and 16%, respectively, with 13% of patients with AUDIT scores greater than or equal to 8.

Conclusion: CASI displays increased detection of alcohol consumption compared with MSE across all ages, both sexes, and patients with a primary language of English and Spanish. A significant number of patients with at-risk consumption were discovered by CASI and received intervention, including under-aged drinkers.

567 Diagnosing Possible Hypertension When Emergency Department Blood Pressure Is High
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Background: Emergency physicians often refer to primary care specialists for follow-up of conditions identified in the emergency department (ED). The American College of Emergency Physicians (ACEP) recently published a clinical policy recommending that patients with high blood pressure (BP) be referred for evaluation of possible hypertension.
569 Risk Factors for Violent Injury Among Adolescents and Young Adults Accessing an Urban Emergency Department

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Background: Prior studies have identified common risk factors among youth who are violently injured, including community violence, past violent behavior, peer behavior, and substance use.

Objectives: To assess the prevalence of risk factors for violent injury among adolescents and young adults at an urban emergency department in a Level I trauma center.

Methods: This is a cross-sectional analysis of initial data collected as part of a longitudinal cohort study. All patients aged 12–24 years old were eligible, regardless of presenting complaint. Patients were excluded if they were incarcerated, critically ill, or unable to read and write in English. Study participants completed written, multiple-choice questionnaire using previously validated surveys, including segments of JCI-90, the SAGE survey, and the Denver Youth Survey. The questionnaire included measures of a) aggression, b) perceived likelihood of violence, c) recent violent behavior, d) peer behavior, e) community exposure to violence. Participants were assessed as scoring high on a scale if they answered “somewhat” or “very likely” (or “fairly often”/“most of the time”) on more than 50% of items within a given assessment. Data were analyzed using SAS 9.2, with chi-square analyses performed.

Results: Two hundred and twenty-six eligible patients were approached, of whom 200 (88.5%) consented. Average age was 21.0 years (range), and participants were 55% female, 86.5% African American, and 82.2% were educated at the high school level or beyond. Among study participants, 19.5% reported high frequency of hostile and aggressive feelings, 9.5% showed a high level of self-reported likelihood of engaging in violent behavior within the next three days. Eleven percent reported high levels of aggressive/violent behaviors in the past six months. Twelve percent scored high with regard to violent/delinquent behaviors among their friends. Twenty-six percent reported witnessing high rates of community violence. These findings were not significantly different when comparing patients who presented with complaints due to injuries vs. medical complaints, with the exception of likelihood of future violent behavior (RR=4.0).

Conclusion: Many youth presenting to an urban emergency department show risk factors for violent injury, regardless of presenting complaint. Youth who do present with an injury are at significantly higher risk of expecting that they will engage in violent behavior in the near future.

570 Does Gun Accessibility Lead to Violence-related Injury? (Originally Submitted as a “Late-breaker”)

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Background: The rate of violence in the inner city population is at epidemic proportions. Much of this violence is gun-related. Victims of gun violence are commonly seen in emergency departments (EDs). There is evidence that this higher rate of gun violence among youth in the United States is attributed to a higher level of access to guns.

Objectives: The purpose of the study was to determine the relationship between gun accessibility and risk of violence-related injuries in youth and young adults. The secondary purpose is to determine the relationship between gun accessibility and violent behavior.

Methods: This study was a convenience sample in an inner city Level I trauma center of 100 victims of violence and 100 patients seen for non-violent related problems. A 28 item questionnaire consisting of a seven question short gun questionnaire, New York City (NYC) Youth Violence Survey, a nine item questionnaire, and the SAGE Baseline questionnaire (a 12 item questionnaire) was given to all consenting youth (or consenting parents). Patients’ reasons for the ED visit and other basic demographic information were also recorded.

Results: A total of 201 subjects completed the survey, with 100 being seen for violence-related injuries and 101 for non-violence-related injuries. The majority was at 65% (130) African American and 32% (65) were Hispanic with less than 2% Caucasian. Those with violence-related injuries do not, however, have a higher rate of gun accessibility compared to youth who presented with non-violence-related injuries. They do, however, show a difference in their attitudes towards guns. The subjects who came into the ED with violence-related injuries felt that having a weapon is a way to avoid a fight (F=4.68, p=0.032). Those presenting with violence-related injuries are more likely to have grabbed or shoved someone in the last 6 months (F=1.35, p=0.029), have punched someone in the last 6 months (F=11.9, p=0.011), and have been seen in the ED within the last six months for a injury related to being punched, attacked or shot (F=117 p= 0.00) as compared to those with non-violence-related injuries.

Conclusion: There was no difference between groups related to victims of violence and the rate of gun accessibility. There is a difference between patients who present to the ED who were injured due to violence versus non-violence. The difference was seen in questions assessing attitudes towards and past experience with guns and violence.

571 Emergency Department Provider Survey on Tobacco Cessation Interventions

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Background: Brief counseling for tobacco cessation (TC) is effective, yet emergency department (ED) staff rarely provide such counseling. Direct input from practicing ED staff is needed to ensure incorporation of TC into clinical practice.

Objectives: To determine ED staff members’ recommendations regarding the structure, processes, barriers, and logistics of ED-initiated tobacco interventions.

Methods: We surveyed a range of ED staff (physicians, physician extenders, and nurses) from institutions participating in a cohort study on TC. Staff working at least half-time in the ED were eligible. Non-respondents were provided a reminder and...
additional survey at 14 and 30 days. The survey assessed willingness to incorporate the same hypothetical ED-initiated TC interventions and counseling styles presented to patients in the cohort study. The survey was patterned after existing surveys, piloted on a sample of ED staff, and revised based on feedback. Data are reported as means and proportions with 95% confidence intervals (CI).

**Results:** We received 800 surveys, a 64% response rate. The mean (SD) age of respondents was 37 (10) years and 56% were female. Nurses represented 35% of the respondents, residents 33%, and attending physicians 32%. Only 24% (95% CI 21–27%) reported having formal training in tobacco counseling. Most usually or always ascertainment patient smoking status (75%, 95% CI 72–78%). Only 16% (95% CI 13–18%) usually or always provided brief counseling on tobacco cessation and only 28% (95% CI 24–31%) supported personally spending 3 minutes or more on counseling. The most acceptable interventions (likely or very likely to use) were providing a list of stop-smoking referral resources (74%, 95% CI 68–75%), providing educational materials on smoking cessation (68%, 95% CI 64–71%), and providing a referral to the national Quitline (65%, 95% CI 61–68%). The least acceptable interventions were writing a prescription for a medication to help patients quit (20%, 95% CI 17–23%), and obtaining a release to fax the name and phone number to a counselor (15%, 95% CI 13–18%).

**Conclusion:** Emergency department staff usually assess smoking status, but less frequently provide TC counseling. Brief, simple interventions are preferred as compared to interventions such as writing prescriptions or providing direct referrals.

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**572 Emergency Department Utilization: A Prospective Cohort Study of Adults With Sickle Cell Disease**

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**Objectives:** To report emergency department (ED) utilization pattern differences among a cohort of adults with sickle cell disease (SCD) between three sites.

**Methods:** A multi-center, prospective, longitudinal surveillance study enrolled patients from three academic medical centers (urban and rural) from 10/1/07 to 8/1/09. All ED patients >=18 years with a chief complaint of a sickle cell pain episode were eligible for inclusion. Site 1 had two hematologists and Site 2 did not have any providers designated to take care of adults with SCD. Site 3 used an organized sickle cell team to manage patients. The team was led by an internist and included a social worker and nurse practitioner. Patients were managed in the clinic by the entire team who were also available as consultants for ED visits and hospital admissions. Descriptive statistics are used to report the mean (SD) number of visits/total number of patients at each site, and median (IQR) number of visits per individual patient per site. Analysis of variance was used to determine differences (mean difference, 95% CI) between sites.

**Results:** Three hundred and forty-two unique patients (57% female, mean [SD] age; 32 [11]) had a total of 2934 visits between all three sites. The total number of patients, visits) at each site were: Site 1 (99, 959), Site 2 (31, 807), and Site 3 (212, 1169). The range of total number of visits per site per patient were: Site 1 (1–175), Site 2 (1–190), and Site 3 (1–79). The mean (SD) number of visits/total number of patients at each site respectively were: Site 1 = 10 (21), Site 2 = 26 (44), Site 3 = 6 (9). Sites 1 and 2 had a statistically higher number of visits per total number of patients when compared with Site 3 (mean difference, 95% CI, p<0.01). Site 1 (33; 28, 38), and Site 2 (76; 71, 81). The median (IQR) number of visits per individual patient at each site were: Site 1 (2; 1, 10), Site 2 (6; 2, 32), and Site 3 (1; 1, 6). Site 2 had the highest number of visits per individual patient (mean difference, 95% CI, p<0.01) when compared with Site 1 (16; 7, 25), and Site 3 (21; 12, 29).

**Conclusion:** Use of an organized interdisciplinary model of care for adults with SCD can significantly decrease ED utilization.
approached for enrollment, and whether they were enrolled in a study. Screening logs were combined with administrative data to determine characteristics of patients who presented, and who were screened, approached, and enrolled. Logistic regression determined the effects of age, race, and sex on opportunities to engage in research and willingness to do so.

**Results:** There were 365,479 visits during the study period. Mean age was 44 yrs, 45% were black, 48% were male. The Figure shows flow of patients through screening and enrollment. The Table shows estimated effects of age, race, and sex on objectives. With increasing age, patients were more likely to be screened and approached and less likely to be willing to discuss and enroll. Blacks were more likely to be approached and less likely to enroll. Women were more likely to be screened, but less likely to be approached and enrolled. Similar patterns were observed with multivariate regression that included hospital and insurance type.

**Conclusion:** Multiple influences affect enrollment in ED-based research. In our setting, elderly and blacks are given more opportunities to participate, while women are given less. All three underrepresented groups are less likely to enroll, supporting the argument that lack of patient trust has more influence on research participation than lack of opportunity. Project supported by Institutional Clinical and Translational Science Award, NIH/NCRR Grant Number 5UL1RR026314-02.

### 575 Community Voices: Educational Modules Improve Community Consultation for Emergency Research Conducted With an Exception From Informed Consent Among Diverse Racial/Ethnic Groups

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**Background:** Federal regulations allow an exception from informed consent (EFIC) for certain emergency research studies on life-threatening conditions but require community consultation (CC) prior to granting an EFIC.

**Objectives:** The Community VOICES (Views on Informed Consent in Emergency Situations) Study developed educational modules that are aimed at community members with minimal understanding of research principles so as to empower them to engage in CCs. The modules explain how a clinical trial works; how risks, burdens and benefits are weighed; roles and responsibilities of investigators, IRBs, and study participants; ethical principles of research; informed consent and the EFIC regulations.

**Methods:** Educational modules were developed in English and Spanish by investigators, refined by focus groups convened for this purpose, piloted, revised based on feedback, then presented to four racially homogenous groups (African American, English-speaking Hispanic, Spanish-speaking Hispanic, Caucasian) to assure cultural appropriateness, and were later used in mock CCs on an EFIC study.

**Results:** The 85 participants were 24% African American, 18% English-speaking Hispanic, 38% Spanish-speaking Hispanic, 21% Caucasians; aged 19–83 years. Although most (82%) were initially unfamiliar with at least one of the topics covered, post-presentation most understood very well or extremely well: randomization (87%), clinical trial (79%), informed consent (79%), IRB (78%), control group (75%), intervention group (67%), and community consultation (68%). Bivariate analysis revealed participants felt more comfortable speaking with investigators about research after hearing the presentation as compared to before (p<0.01). Pre-post increases in understanding and improved comfort in speaking with an investigator were seen in all four racial/ethnic groups. Subsequent randomized use of these modules in mock CC sessions (n=61) improved participants’ understanding of EFIC research.

**Conclusion:** These educational modules show promise for improving the quality of communication about emergency research involving community members with diverse backgrounds and demonstrate the value of translating materials to enable community members with limited English proficiency to be included in EFIC consultations.

### 576 Health Care Workers and the Mandated H1N1 Vaccine: A Survey to Assess Employee Perception

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**Background:** Given the recent H1N1 Influenza pandemic of 2009, the discussion regarding mandatory hospital employee influenza vaccination has resurfaced. A community medical center in Chicago, Illinois instituted a mandatory employee influenza vaccination policy for the 2009–2010 influenza season.

**Objectives:** This survey study queried health care workers regarding their perceptions of the H1N1 influenza virus, the vaccine, and the mandated vaccination policy.

**Methods:** Prospective voluntary 17-question paper-based survey of health care workers in “high-risk” hospital departments. Outcome measures include vaccination rates, attitudes regarding vaccinations, and perceptions of the new mandatory policy.

**Results:** Of the 202 responses, 91.6% received mandated vaccinations; 54.6% before the mandate and 45.4% after the mandate. Among highlights of the study, 25.2% stated it was their duty to be vaccinated and 30.7% felt it would protect patients and prevent employee sick days. In opposition to the mandate, 31.7% responded that it was an infringement on their rights and 17.3%
held the opinion that most staff would have taken the vaccine voluntarily, obviating the need for the mandate. The consequences of eventual termination for refusing the mandated vaccine generated a spectrum of attitudes: 20.3% of hospital employees deemed it as an appropriate penalty, 43.7% regarded it as an unfair punishment, 3.5% stated they would electively seek employment elsewhere, and 32.5% answered unsure.

Conclusion: These data shed light on controversial ethical arguments regarding mandatory vaccination and identify barriers and misconceptions held by health care workers. Although 30.7% felt that mandated vaccination would benefit patients, 31.7% felt an infringement on their rights.

577 A Mixed-methods Assessment of Persons Opting Out of an Exception From Informed Consent Cardiac Arrest Trial
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Background: Exception from informed consent (EIC) research remains controversial and little is known about people who opt-out or their reasons for doing so.

Objectives: We sought to characterize persons who wanted to opt out of a cardiac arrest EIC trial and to describe common themes for such preferences.

Methods: During a 10-site out-of-hospital cardiac arrest trial in 2008-9, we provided opt-out bracelets to persons in the study region who contacted us about opting-out of the trial. We asked bracelet requesters to complete an optional survey, administered by phone interview, web, or direct mail. The standardized questions included Likert scale questions, free-text responses, and basic demographics. We used descriptive statistics to characterize the sample. Two authors used standard qualitative analysis to identify common themes to explain reasons for opting-out and related belief systems.

Results: Over the 18-month study period, 60 bracelets were requested by 50 community members; surveys were completed by 46 persons (the primary sample). Respondents had a mean age of 60 years, were Caucasian (74%), female (74%), and had more than high-school level education (85%). 54% identified themselves as religious. Seventy percent of respondents supported emergency medicine, 3.5% stated they would electively seek employment elsewhere, and 32.5% answered unsure.

Conclusion: These data shed light on controversial ethical arguments regarding mandatory vaccination and identify barriers and misconceptions held by health care workers. Although 30.7% felt that mandated vaccination would benefit patients, 31.7% felt an infringement on their rights.

578 Assessment of Frailty in Older Emergency Department Patients
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Background: Frailty (defined by Fried as weakness, slowness, weight loss, exhaustion, and physical inactivity) is characterized by increased vulnerability to stressors including acute illness. Frail older patients are at increased risk of emergency department (ED) visits, hospitalization, disability, and death.

Objectives: To assess the feasibility of identifying frailty in the ED, the prevalence of frailty in older ED patients, the agreement of subjective and objective weakness and slowness, and the association between frailty, weakness, and functional limitations.

Methods: We performed a prospective cross-sectional study of discharged patients ≥65 years old in an urban community teaching ED. We excluded those who could not answer questions or perform measurements and those from skilled nursing facilities. We used Fried’s frailty definition and the Older Americans Resources and Services Activities of Daily Living (ADL) scale. The Rapid Assessment of Physical Activity assessed physical inactivity. We measured subjective and objective weakness and slowness. Data were analyzed using Stata and reported as means and proportions with 95% confidence intervals (CIs). Associations were measured using 95% CI for the difference between proportions. Ninety patients provided an approximate 95% CI of ±10%.

Results: We enrolled 90 patients. The mean age was 76 ± 6.4 SD years; 51% were male. Mean assessment time was 7.4 minutes (95% CI 6.9 - 7.9). Twenty percent of patients were frail (18/90, 95% CI 12-30%); 70% were prefrail (63/90, 95% CI 59-79%). For weakness, agreement was 68% (95% CI 57-77%); slowness agreement was 49% (95% CI 39-60%). Frail and weak patients were more likely dependent in one or more ADL (26% difference, 95% CI 1-51% and 20% difference, 95% CI 1-41%, respectively).

Conclusion: Frailty is common in discharged older ED patients and can be rapidly assessed. Subjective assessments of weakness and slowness cannot be used reliably. Frailty and weakness were associated with ADL dependence.

579 Weakness and Fatigue in Older Emergency Department Patients in the United States, 2003–2007
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Background: Generalized weakness and fatigue (W&F) are common complaints in older emergency department (ED) patients.

Objectives: To estimate the prevalence of W&F as a complaint in older ED patients, to compare demographics and resource use of W&F with non W&F patients, and to determine the diagnoses of W&F patients.

Methods: We performed a cross-sectional cohort analysis of ED visits from the 2003–2007 National Hospital Ambulatory Medical Care Surveys. We examined those ≥65 years. W&F was defined as one of the three Reason for Visit codes being generalized weakness (1020.0) or tiredness, exhaustion (1015.0). Data were aggregated and national estimates were produced using patient weight, strata, and primary sampling unit variables. Descriptive data are presented as totals, means, and proportions with 95% confidence intervals (CIs). Comparisons between cohorts (with and without W&F) used chi-square for proportions and the adjusted Wald test for means. Stata11 was used for data analyses.

Results: There were 181,786 observations over 5 years, representing 575 million ED visits. Patients ≥65 made 14.7% (95% CI 14.2-15.3) of visits. Overall 6.0% (95% CI 5.6-6.4) of these visits presented with W&F. W&F was the fifth most common chief complaint after trauma, dyspnea, chest pain, and abdominal pain. While W&F increased with age, there were no differences in race, sex, or nursing home residence for those with and without W&F. W&F patients had longer ED lengths of stay (300 vs. 249 minutes, p<0.001), and more diagnostic tests (7.7 vs. 5.0, p<0.001), procedures (5.7 vs. 4.7, p<0.001), and hospital admissions (6.5% vs. 5.5%, p<0.001); there was no difference in ICU admission (3.8 vs. 3.5%, p=0.77). W&F patients were more likely to have infectious disease diagnoses (22 vs. 16%, p<0.001). The most common primary diagnoses for those with W&F were “other malaise and fatigue”, pneumonia, and urinary tract infection.
Conclusion: Weakness and fatigue is common in older ED patients. These patients undergo more tests and procedures, and the majority are admitted. Further research into the pathophysiology and management of W&F is warranted.

580 Patterns of Medication Use and Adverse Events in Geriatric ED Patients  
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Background: Nearly one-third of adults aged 65 and older are on five or more prescription medications; 42% take at least one over-the-counter drug, and 49% take at least one nutritional supplement. The risk for a drug-to-drug interaction increases to over 50% once a patient is on four or more drugs. Given this background, we sought to determine whether medications administered to older patients in the emergency department (ED) affected medical outcomes for this age group.

Objectives: To determine which medications are most frequently administered in the ED to geriatric patients and determine whether medication categories or combinations were associated with a return ED visit within 72 hours, or a hospital admission within 30 days.

Methods: Demographics, medications administered during ED visit, route of administration, and outcomes following ED discharge suggestive of potential medication adverse events (return ED visit within 72 hours) or underlying disease processes (hospital admission within 30 days following ED discharge) were obtained from review of medical records and medication logs in patients >65 years seen in the ED during the study period. Drugs were categorized by generic name, and then collapsed into 14 categories. Statistical models were constructed to predict medication factors associated with rates of return ED visits within 72 hours and 30-day hospital admission rates.

Results: A total of 11,384 medication orders were given. The most common medication categories were opiates (19%), followed by antimicrobials (16%) and cardiac medications (13%). The most common medications were morphine 12%, ondansetron 6.8%, and aspirin 5.7%. Medications were administered by the intravenous route 67% of the time. An association between the category of medication and 30-day readmission rate was statistically significant (ANOVA, P<0.001), but association with 72-hour return ED visit was not.

Conclusion: Medications were most frequently administered via the IV route. The category of medication administered demonstrated significant correlation with the 30-day hospital re-admission rate but not rates of return ED visits within 72 hours. This finding suggests that, despite the potential for interactions of ED-administered drugs with regular medications taken by older ED patients, serious interactions requiring a return ED visit within 72 hours are uncommon.

581 Resource Use of Older Adults Patients in an Observation Unit for Acute Coronary Syndrome  
Luna Ragsdale, Abhi Chandra, and Alexander Limkakeng  
Duke University, Durham, NC

Background: Older adults (age 65 years and over) are the fastest growing segment of the population. Furthermore, they tend to have more emergency department visits than younger adults with chest pain as the most common presenting complaint. Observation units (OUs) have been proposed as safe and cost-efficient methods for ruling out acute coronary syndrome (ACS). However, the lower costs associated with observation may not hold for older adults due to higher rates of specialized stress testing and inpatient admission.

Objectives: We hypothesized higher rates of enhanced cardiac stress testing (pharmacologic stress or cardiac magnetic resonance imaging) and inpatient admissions in older adults in an OU compared to a younger population.

Methods: We performed a retrospective observational cohort study of an urban academic emergency department OU. Data were obtained from an acute coronary syndrome registry from 4/2004–7/2007. Trained abstractors extracted data from electronic records using a standardized report form. Patients placed in the OU to rule out ACS without definite evidence of acute cardiac ischemia or infarction were eligible. Stress test modality was determined by the treating physician and approved by a cardiologist supervising the test. The rates of enhanced cardiac stress testing and inpatient admissions in older adult patients were calculated with 95% confidence intervals. The proportion of admissions despite negative stress tests was likewise calculated.

Results: Overall 2215 patients were analyzed, with a total of 134 ACS events (defined by positive stress test). Older adults accounted for 23% of patients but nearly 40% of all ACS events. The rates of enhanced cardiac stress testing and inpatient admissions in older adults were 43.3% (95%CI 38.11–48.6%) and 18.2% (95%CI 15.1–21.75%), respectively, compared to 22.5% (95%CI 20.2–24.9%), and 13% (95%CI 11.4–14.7%) in the rest of our OU population. The proportion of admissions despite negative stress tests were 4.12% (95% CI 1.99–7.44) in older adults compared to 6.64% (95% CI 3.44–6.11%) in younger patients.

Conclusion: Older adult patients have a higher ratio of ACS, enhanced cardiac stress testing, and inpatient admissions compared to younger patients although admission rates were less than 20%. Further studies should perform cost-benefit analysis of ACS evaluation in older adults in the OU.

582 Geriatric Emergency Department Patients’ Interest in Preventive Health Services  
Timmy Li, Courtney Marie Cora Jones, and Manish N. Shah  
University of Rochester Medical Center, Rochester, NY

Background: The size of the older adult population is rapidly increasing and many older adults have unmet needs. Because older adults frequently visit emergency departments (EDs) each year, the ED is a potential site to identify older adults needing preventive health services (PHS) and to deliver those services.

Objectives: The primary objective was to assess older adults’ level of interest in receiving PHS during an ED visit. It further aimed to assess the most acceptable mode of delivering PHS during an ED visit and to assess which preventive health topics are of interest to older adult ED patients.

Methods: Older adult (age ≥60 years) patients presenting to an academic medical center ED between March and July 2010 were approached to participate. Subjects were interviewed with a standardized questionnaire which asked subjects for demographic information and to rate their levels of interest in receiving PHS via three different modes (informational brochures, screening, and interventions/referrals) for 13 specific preventive health topics. Descriptive statistics, 95% confidence intervals, and non-parametric tests were used to describe the study sample.

Results: A total of 333 subjects consented to participate and had usable data for all variables. The majority of subjects (75%; 70–79%) reported interest in receiving PHS during an ED visit. Those interested in receiving PHS during an ED visit were younger (p<0.05) and of non-white race (p<0.05). Subjects reported interest in receiving PHS via informational brochures (58%; 53–63%), screening (49%; 44–54%), and intervention/referral (57%; 52–62%). The three specific preventive health topics subjects were most interested in receiving PHS for were cancer (65%; 60–70%), fall/injury prevention (64%; 59–69%), and dementia (63%; 58–69%). Subjects were least interested in receiving PHS for tobacco (21%; 17–26%), drug (26%; 21–31%), and alcohol (26%; 21–31%) use.

Conclusion: The majority of older adults in this sample were interested in receiving some form of PHS during an ED visit. Topics of greatest interest were conditions that have a high...
were calculated for all variables with significant associations.

Follow-up was performed at 14 days. Clinical vari-

ease findings, clinician pre-test probability of stroke, and neuro-

dness from 11/1/09 to 10/30/10. Data collected included patient demo-

Objectives: To prospectively identify high-risk clinical features

Methods: We conducted a prospective multicenter cohort study

Results: There were 473 patients enrolled; patients were 61%

Conclusion: In this socio-demographically representative sample of

Background: Acute stroke, particularly of the posterior circula-

tion, may present with nonspecific dizziness complaints. A missed

delayed diagnosis may result in significant morbidity and mor-

tality, but there are no current risk stratification tools for undiffer-

etiated emergency department (ED) patients with dizziness to aid

Background: Acute stroke, particularly the posterior circulation,

Methods: We conducted a prospective multicenter cohort study

Results: Over 9 months beginning in July 2009, 892 patients were

Methods: Searches of MEDLINE, EMBASE, the Cochrane trials

Results: Overall, the computerized search identified 314 citations

Objectives: To determine pain and functional outcomes 1 week

Background: Acute migraine headaches are common emerg-

cency department (ED) presentations and numerous treatment

Methods: Searched of MEDLINE, EMBASE, the Cochrane trials

Results: Over 9 months beginning in July 2009, 892 patients were

Background: Acute stroke, particularly of the posterior circula-

Methods: A prospective cohort of low back pain patients who

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Conclusion: In this socio-demographically representative sample of

Background: Acute migraine headaches are common emerg-

cency department (ED) presentations and numerous treatment

Methods: Searches of MEDLINE, EMBASE, the Cochrane trials
(WMD = 0.07; 95% CI: -0.39 to 0.54). KET and meperidine resulted in similar pain assessment at 60 minutes (WMD = 0.31; -0.68 to 1.29); however, KET was more effective than intranasal sumatripan (WMD = -4.07; 95% CI: -6.02 to -2.12). While there was no difference in pain relief at 60 minutes between KET and phenothi-azine agents (WMD = 0.82; 95% CI: -1.33 to 2.98), heterogeneity was high ($I^2 = 70\%$). Side effect profiles were similar between KET and comparison groups.

**Conclusion:** Overall, KET is an effective second line agent for the relief of acute migraine headache in the ED setting. Toradol is less addictive and sedating than meperidine and is more effective than sumatripan; however, it may not be as effective as metoclo- pramide and phenothiazines agents.

### 586 Statewide Availability of Stroke Resources in North Carolina

**Jane H. Brice, Trent Wei, Frances Shofer, Greg Mears, and Charles Cairns**

*University of North Carolina, Chapel Hill, NC*

**Background:** Regionalization of stroke care requires organized placement of stroke-related resources.

**Objectives:** We assessed the location of North Carolina (NC) hospital stroke resources as a measure of preparedness to enact regionalization. We hypothesized that current stroke resources, including physician specialists and bed capacity, are not strategically located to facilitate regionalization.

**Methods:** This cross-sectional study used data from the NC State Medical Asset Resource Tracking Tool, a state-mandated emergency database that records daily resource capability for 101 NC acute care hospitals. Stroke-specific physician (i.e., noninvasive neurology, invasive neurology, and neurosurgery) and bed resources (i.e., medical floor, general ICU, neurosurgery ICU) were tracked for 1 year. Hospitals were categorized into quartiles by population density (low: 0–44K, medium low: 44K-80K, medium (77%) were located in medium high (14) and high (21) population density areas. Stroke-specific bed availability did not differ by population density (p > 0.3 for all bed types).

**Conclusion:** Stroke-specific physician and bed resources are concentrated in population centers that are not evenly distributed throughout the state. Time-sensitive regionalized acute stroke care requires organized distribution of resources.

### 587 Effect of an Acute Stroke Notification System on Stroke Assessment

**Robert B Dunne and Carrie Stover**

*St John Hospital, Detroit, MI*

**Background:** Effective acute stroke care remains time dependent. Our hospital has an active group of stroke neurologists and a neuro interventional service.

**Objectives:** We hypothesized that a series of interventions in the triage and notification process could speed the assessment and care of stroke patients. We rolled these out in one package as “code stroke”. This included a computer-based notification system that simultaneously notified radiology, neurology, and neuro intervention; a triage algorithm that made all patients with acute stroke symptoms a 1 on our triage priority scale; NIH stroke scale documentation prompt for the emergency department (ED) physician; and a rapid result system for radiology. No additional personnel are allocated to this program and the technologies used were already owned by the health care system.

**Methods:** Pre-initiation vs post-initiation analysis of the code stroke protocol data was done after a 4 month run-in. Data from September 2009 to September 2010 (the post-code stroke period) were compared to September 2007 to September 2008 (the pre-code stroke period). Patients are identified from the notification system and data are linked from the order entry system and patient record. Data points analyzed are time from arrival to CT result, time from notification to call back for the stroke neurologist, and percentage of records with NIH stroke scale documented. Number of patients treated with TPA was compared to the pre code stroke period.

**Results:** There were a mean of 49.7 code stroke notifications per month with an ED daily average volume of 292 during the study period. Time from CT order to CT result pre-code stroke - 78 minutes, post-code stroke - 55 minutes (p=0.0001). Time from page notification to call back pre code stroke - 22 minutes, post-code stroke - 2 minutes (p<0.0001). Percentage of ED stroke charts with NIH stroke scale documented pre-code stroke - 72%, post-code stroke - 98% (p<0.0001). Patients treated with TPA pre code stroke - 8, post-code stroke - 40.

**Conclusion:** A coordinated program using modern, easily available technologies can reduce the time to assessment of acute stroke patients and result in more patients being treated for stroke.

### 588 The Effect of Spinal Needle Characteristics on the Measurement of Opening Pressure

**Venkatesh R Bellamkonda-Athmaram, Michael Olson, and Torrey A Laack**

*Mayo Clinic, Rochester, MN*

**Background:** While evaluating a patient with suspected idiopathic intracranial hypertension (IIH) in the emergency department (ED), an intern physician asked whether the spinal needle used for lumbar puncture would affect the opening pressure measurement (OPM) obtained. Spinal OPMs may be helpful in many diagnostic situations including the evaluation of IIH (as in this case), tuberculous meningitis, hydrocephalus, and other neurologic diseases. To
date, however, there has not been a detailed evaluation of the effect spinal needle length, gauge, and type has on the measurement of opening pressure or the time to measurement (TTM). In addition, clinicians may question whether Whitacre needles may be used for OPM as there is no conclusive answer to this in the current medical literature.

Objectives: To determine if spinal needle length, gauge, and type will affect the measured opening pressure or the time required to obtain this measurement.

Methods: We used a sequential simulation design with nine separate spinal needles (Figure 1, one spinal needle not pictured) chosen to isolate spinal needle length, gauge, and type (Whitacre/pencil-point versus Quincke/conventional) while obtaining the OPM and TTM on the Lumbar Puncture Simulator II (Kyoto Kagaku Co., LTD) shown in Figure 2. To minimize effect of founders, the operator, water volume, height of simulator, height of needle insertion, interspace, bevel position, manometer, and angle of entry were standardized. Each needle was used in sequence once and then repeated. To ensure accuracy, each OPM and TTM was agreed upon by all three researchers.

Results: Overall, the OPM varied between 23.0 and 24.2 cm H2O with an average measurement of 23.7 cm H2O. The TTM varied between 25 and 919 seconds with a median time of 153 seconds. The detailed results are shown in the Table.

Conclusion: The spinal needle gauge, type, and length have minimal effect upon the measured opening pressure, whereas the TTM is directly and notably increased when higher gauge needles are used. Higher gauge needles have been shown to decrease the risk of post-lumbar puncture headache; however, the increased TTM could prove problematic in a busy ED setting. Furthermore, clinicians may obtain falsely low readings if the measurement is recorded prematurely. Lastly, Whitacre, or pencil-point needles appear to be reliable in measuring opening pressure.

589 Cost-effectiveness of Diagnostic Strategies for Evaluation of Suspected Subarachnoid Hemorrhage in the Emergency Department

Michael J. Ward1, Jordan B. Bonomo1, Opeolu Adeoye1, Ali S. Raja2, and Jesse M. Pines3

1University of Cincinnati, Cincinnati, OH; 2Brigham and Women’s Hospital, Boston, MA; 3George Washington University, Washington, DC, DC

Background: The diagnosis of subarachnoid hemorrhage (SAH) in emergency department (ED) patients is challenging. Evaluation is variable and 12% of SAH patients are misdiagnosed. Diagnostic strategies include computed tomography and lumbar puncture (CT/LP), CT alone, CT with magnetic resonance angiography (CT/MRA), and CT with CT angiography (CT/CTA). While some consider the CT/LP as the standard of care, the relative cost-effectiveness of these strategies is unknown.

Objectives: To determine the cost-effectiveness of diagnostic strategies for SAH.

Methods: We created a decision model (TreeAge 2009) using the societal perspective and a willingness-to-pay threshold of $50,000 per quality adjusted life year (QALY) to evaluate the cost-effectiveness of these different strategies in a 45 year-old presenting >12 hours after onset of a severe headache with an otherwise normal neurological exam. Costs were estimated from the Medicare hospital reimbursement and professional fees data from the 2009 National Physician Fee Schedule. Clinical probabilities were obtained from published data; sensitivity analyses were performed across plausible ranges.

TABLE

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<th>LENGTH (inches)</th>
<th>GAUGE</th>
<th>TYPE</th>
<th>PASS ONE OPM (cm H2O)</th>
<th>PASS ONE TTM (sec)</th>
<th>PASS TWO OPM (cm H2O)</th>
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Base Case Results of Diagnostic Strategies

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<th>Incremental Cost ($)</th>
<th>Effectiveness (QALYs)</th>
<th>Incremental Effectiveness (QALYs)</th>
<th>C/E ($/QALY)</th>
<th>Incremental C/E (ICER)</th>
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590 Predictive Value of Spectrophotometric Xanthochromia in Suspected Subarachnoid Hemorrhage in the Emergency Department

Anne Gangloff, Marcel Émond, Jeffrey J Perry, Pierre Baril, Linda Nadeau
1Université Laval, Quebec, QC, Canada; 2Unité de recherche traumatologie-urgence et soins intensifs, Quebec, QC, Canada; 3Ottawa Health Research Institute, Ottawa, ON, Canada; 4Département de Biochimie, CHA-HEJ, Quebec, QC, Canada

Background: The absence of xanthochromia is used to exclude subarachnoid hemorrhage (SAH). Few studies have evaluated the diagnostic ability of xanthochromia by spectrophotometry in the emergency department (ED).

Objectives: Our objective was to establish the predictive value of xanthochromia for SAH.

Methods: We conducted a historical cohort study of ED patients with suspected SAH from 2003 to 2009. We included patients more than 14 years old with a GCS score of 15, a chief complaint of non-traumatic headache, and a normal CT who had a lumbar puncture conducted 12 hr after ictus in 79.1% of cases. There were no differences in baseline characteristics. Overall, the prevalence of SAH was 0.3% (95% CI: 0.2–0.4) in the population and 1.7% (95% CI: 1.2–2.3) in patients with a positive SAH.

Results: Six hundred forty-five charts were reviewed; 17 (2.6%) had a positive SAH and 11 (1.7%) had clinically significant SAHs. There were no differences in baseline characteristics. Overall, the prevalence of SAH was 0.3% (95% CI: 0.2–0.4) in the population and 1.7% (95% CI: 1.2–2.3) in patients with a positive SAH.

Conclusion: Despite evidence that CTA and MRA are sensitive for SAH in ED patients with a headache, CT/LP remains the most cost-effective strategy unless the pretest probability of SAH or the sensitivity of the LP are very low. A risk stratification tool could help optimize choice of diagnostic strategies in ED patients with possible SAH.

591 Does This Emergency Department Patient With Altered Mental Status Have Nonconvulsive Seizure?

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Background: Definitive diagnosis of non-convulsive seizure (NCS), including non-convulsive status epilepticus (NCSE), can be made only by EEG, and delay in diagnosis and treatment can increase morbidity, resource utilization, and length of hospitalization. It is imperative that emergency department (ED) physicians be aware of the risk of NCS to accurately incorporate it into the differential diagnosis of patients with altered mental status (AMS).

Objectives: To perform a structured, evidence-based review to estimate the prevalence of NCS and NCSE, in ED patients with acute onset of AMS.

Methods: The authors searched PUBMED, EMBASE, the Cochrane Library, and other resources for studies that included AMS and seizure as topics. The publications were then reviewed for predetermined inclusion and exclusion criteria. For example, a diagnostic EEG had to be performed within 24 hours of presentation. Studies that enrolled patients with clinically obvious seizures or when the EEG was ordered to confirm suspected brain death were excluded. Two authors assessed the quality of each included study separately using standard published criteria. The outcome of interest was the prevalence of NCS in patients presenting with AMS. The prevalence of NCS was reported as percentage with 95% confidence interval (CI). We also calculated the relative risk (RR) of NCS in AMS patients with history of epilepsy if the required raw data were provided in the original paper.

Results: The initial search yielded 276 articles, of which five studies enrolling 478 patients remained for review. One study enrolled only pediatric patients while the other four enrolled patients of all ages (range 1 month to 95 years). The prevalence of NCS in AMS patients in the five studies ranged from 8% to 30% (overall prevalence of 21.5%; 95% CI 18% to 25%). A history of epilepsy was associated with an increased risk of NCS (RR 1.8; 95% CI 1.0 to 3.2, p = 0.04) in the one study that provided this information.

Conclusion: The prevalence of NCS in ED patients with AMS without obvious cause is between 8% and 22%, and is increased in patients with a history of epilepsy. NCS cannot be diagnosed at the bedside, as by definition there is no obvious motor seizure activity. Thus, in patients with AMS of unknown cause, ED physicians should have a high index of suspicion for NCS/NCSE and obtain a diagnostic EEG as quickly as possible.

592 Acute Headache in Children Presenting to a Pediatric Emergency Department

Antonio Muñiz
Houston, Bellaire, TX

Background: Headache is a common presenting complaint to emergency departments with most benign but may also be the initial symptom of life-threatening disorders.

Objectives: The study’s objective was to determine the clinical features and identify characteristics that are more likely associated with serious conditions of a pediatric population presenting with headaches.

Methods: Prospective observational evaluation of consecutive children less than 17 years old who presented with headaches. Etiologies were classified according to the International Headache Society. Data were analyzed using Stata 11 with continuous
variables expressed as means and Student’s t-test or Kruskal-Wallis test used to assess significance, while categorical variables were summarized as frequencies of occurrence and assessed for statistical significance using a chi-square test or Fisher’s exact test.

Results: Two hundred and seventy-five children with 140 (51%) males. Mean age was 9.8 ± 4.4 (95% CI 9.2, 10.3), with a range of 1 to 17 years old. One hundred and ninety (69%) African Americans, 72 (26.1%) Caucasians, 8 (2.9%) Hispanics, and 5 (1.8%) other race. 80 (29.0%) children had fever. Location of headache: bifrontal 111 (40.3%), bilateral 49 (17%), posterior 9 (3.2%), and bitemporal 3 (1.1%). Only 8 (2.9%) had an aura. Diagnostic tests included: CBC 72 (26.1%), basic metabolic profile 41 (14.9%), urinalysis 8 (2.9%), urine pregnancy test 1 (0.36%), rapid streptococcal antigen 12 (4.3%), CXR 2 (1.09%), CT scan of the head 95 (34.5%), and lumbar puncture 6 (2.1%). A neurologic consultation was obtained in 4 (1.4%). Most common diagnoses: viral syndrome (26.9%), nonspecific 61 (22.1%), migraine 33 (12%), contusion 32 (11%), ventriculoperitoneal (VP) shunt malfunction 20 (7.2%), streptococcal pharyngitis 15 (5.4%), and otitis media (20%). Posterior location of the headache and the presence of a VP shunt were associated with serious underlying disease (p < 0.05).

Conclusion: Headaches are a common presentation to a pediatric emergency department. Viral syndrome, nonspecific, migraine, contusion, VP shunt malfunction, and streptococcus pharyngitis account for the majority of the cases. CT scan showed new abnormalities in a minority of patients and should be reserved for those with significant head trauma and to exclude VP shunt malfunction.

593 Epidemiology and Resource Utilization Among ED Patients With Dizziness
Maureen Chase1, Jennifer O’Connor1, Magdy Selim1, Joshua Goldstein2, Daniel Pallin3, Marc Carmacho1, and Jonathan Edlow1
1BIDMC, Boston, MA; 2MGH, Boston, MA; 3BWH, Boston, MA

Background: Dizziness is a common complaint in the emergency department (ED) with both benign and serious etiologies. Uncertainty about etiology often leads to increased testing.

Objectives: To describe the rates of serious diagnoses and the resource utilization and yields for an ‘all-comer’ population of ED patients with dizziness.

Methods: This is a multicenter prospective cohort study of ED patients presenting to three urban academic centers from 11/09 to 10/10. Data collection included patient demographics, past medical history, presenting complaints, physical exam findings, clinician pre-test probability of stroke, and neuroimaging results. Descriptive statistics are used to describe this patient population and the yield of various tests performed.

Results: We enrolled 473 patients during the study period. Mean age was 56.7 ± 19.3 years, 57% male and 72% Caucasian, 17% African American. We found 30 (6.3%) acute, serious diagnoses: 14 acute ischemic strokes (one vertebral dissection), two subarachnoid hemorrhages, seven new masses, two new MS lesions, two cases of severe vertebral artery stenosis, two NSTEMI, one case hydrocephalus/meningitis. There were 179 head CTs and 47 head CTA obtained in the ED (226 total CT/A) yielding 19 (8.4%) acute findings. There were 116 patients who had an MRI during the index hospitalization; 14 MRIs were performed and detected acute stroke; 11 of these patients had a CT and three were reported as normal for a miss rate of 27% for head CT. Of the seven new masses, CT detected all six (100%) masses in patients who had a CT; MRI detected one additional mass. In terms of new clinically relevant findings, MRI also detected one new MS lesion for eight (6.8%) additional findings when compared to CT. In total, 217 (45.9%) were admitted. There were 375 (79.3%) patients who had EKGs, with four (1%) acute findings (two new atrial fibrillation, one bradycardia, one new RBBB) while 341 (72.1%) patients had cardiac enzymes tested and only one had an elevation diagnostic of ACS. There were 138 consults obtained on ED dizzy patients, including 122 neurology and 16 cardiology consults.

Conclusion: Emergency department patients with dizziness consume significant health care resources, often with low yield. Cardiac ischemia is an infrequent diagnosis in the ED dizzy population, though many patients undergo ischemic workup. CT head reliably detected most acute diagnoses, but MRI is required to reliably exclude acute stroke of the posterior circulation.

(Originally Submitted as a “Late-blower”)

594 Is There a Performance Gap in Appropriate Administration of Rh Immunoglobulin?
Betty C Chen, Nicholas W Krehbiel, and Richard T Griffey
Washington University in St. Louis, Saint Louis, MO

Background: Rh immunoglobulin (RhIg) prevents alloimmunization in Rh-negative females with sensitizing events causing exposure to Rh-positive fetal blood. Recently, a quality measure on appropriate administration of RhIg was submitted by the American College of Emergency Physicians for endorsement by National Quality Forum. We are not aware of any data demonstrating a performance gap in this area.

Objectives: To determine whether a quality gap exists in administration of RhIg in our ED.

Methods: Setting: Academic urban, Level I trauma center with an annual volume of 87,000. Participants: All females 14–50. Design: Query and crossmatch of clinical, laboratory, and billing records for a 1-year period and structured chart review to identify and confirm pregnant patients with a sensitizing or potentially sensitizing event. Primary outcome measures were 1) rate of Rh testing in patients in whom testing was indicated and 2) rate of RhIg administration when indicated. Patients receiving RhIg on the day of the ED visit prior to arrival, leaving prior to treatment complete, missing records, known to be post-partum or post-elective abortion, or refused RhIg, were excluded.

Results: Four hundred and forty-four patients had an indication for Rh testing and 270 had a potential indication. Among the 444 females, 290 had Rh testing in the ED and 43 had prior Rh results in the hospital computer system reviewed during the emergency department visit, for a testing performance rate of 75% (333/444). Of the 270 with a potential sensitizing event, 94 had Rh testing and 6 patients had prior Rh results reviewed during the visit, representing a test performance rate of 37% (102/270). Among 30 Rh negative patients in the first group, 50% (15/30) received RhIg. In the potentially sensitized group, 0/8 patients found to be Rh negative received RhIg.

Conclusion: In this single-center study, there appears to be a performance gap in both appropriate testing for Rh and in appropriate RhIg administration.

595 Incidence of Chlamydia Trachomatis, Neisseria Gonorrhoeae, and Trichomonas Vaginalis in Patients Presenting Primarily With Vaginal Bleeding
Bruce Lo1, Christopher Schott1, Catherine Visionnaire2, and Heidi Best1
1Eastern Virginia Medical School, Norfolk, VA; 2Naval Medical Center, Portsmouth, VA

Background: Vaginal bleeding (VB) is a common complaint seen in the emergency department (ED). However, it is unclear if routine testing for sexually-transmitted diseases (STDs) such as Chlamydia trachomatis (CT), Neisseria gonorrhoeae (NG), and Trichomonas vaginalis (TV) are warranted in these patients.

Objectives: We evaluated the incidence of CT, NG, and TV in patients with a chief complaint of VB compared to those with other complaints.

Methods: A retrospective chart review was performed at a single academic hospital. Female patients over the age of 15 were included who presented with a chief complaint that required a pelvic exam and had testing for GC and CT via polymerase chain
reaction technology (DNA probe) and VT via wet prep analysis. Twelve months of data were analyzed from September 2007 to August 2008. Data were analyzed by chi-square and t-tests.

Results: 2457 encounters were reviewed. Of these, 515 patients had the primary chief complaint of VB, while the overall incidence of GC and/or CT was 378/2457 (15.4%). For those who presented with VB, 75/515 (14.6%) were positive for CT and/or NG compared to 303/1942 (15.6%) with another chief complaint (OR = 0.922, 95% CI = 0.701–1.212, P = 0.561). For TV, 12 encounters were excluded due to missing data elements. The overall incidence of TV was 273/2441 (11.5%) with another chief complaint (OR = 0.826, 95% CI = 0.596–1.144, P = 0.248). For patients with a chief complaint of VB, those who complained of pelvic pain had no difference compared to those without pain for GC and/or CT (15.6% vs. 13.7%, P = 0.55), as well as those who were pregnant compared to those who were not (16.1% vs. 13.3%, P = 0.39).

Conclusion: Patients who present with a chief complaint of VB had a similar incidence of CT/NG infection as well as TV infection compared to other complaints. For those with a chief complaint of VB, having abdominal pain or being pregnant did not change the incidence of infection for CT and/or NG. All female patients who present to the ED with a primary complaint of VB should also have an evaluation for STDs.

596 Predictors of Ovarian Torsion Outcome: Age Matters!
Leslie C. Nickels, Latha Stead, Falk E Flach, Yue Du, and Jennifer K Light
University of Florida, Gainesville, FL

Objectives: To determine whether age, race, or insurance status affected the outcomes of patients with ovarian torsion with regard to emergency department (ED) acuity, hospital admission, and length of stay.

Methods: This IRB-approved study was conducted at an academic medical center ED with an emergency medicine residency program which sees over 50,000 adult patients, and 14,500 pediatric ED visits annually. All patients who presented through the ED and had an ultimate discharge diagnosis of ovarian torsion during the five-year period of October 2005 - June 2010 comprised the cohort. Demographic information, radiographic images, and hospital characteristics were collected to assess for correlations. Statistical analyses were performed using JMP 8.0 for Mac, and included ANOVA and regression tests.

Results: The age range was 11–79 years. The median age was 25, with an interquartile range of 19 to 25. Fully 22.2% were pediatric patients. The racial composition was as follows: 2.8% Asian, 19.4% black, 8.3% Hispanic, and 69.4% white. Ninety-two percent of patients were admitted. The hospital length of stay (HLOS) ranged from 1 to 5 days, with a mean of 2.4 days, and a standard deviation of 1.05 (95% CI 2.05–2.7). Seventeen percent did not have pelvic ultrasonography done in the ED. Ultrasonography was more common in pediatric patients. Age was a significant predictor of HLOS (p=0.0038) and showed a trend toward statistical significance (p=0.0736) for ED acuity.

Conclusion: In this hypothesis-generating study, it appears that age is an important variable in the outcome of ovarian torsion. Age was a significant predictor of increased hospital length of stay and showed a trend towards higher ED acuity. These preliminary data are presently being studied to delineate the etiology of ovarian torsion, utilization of imaging studies, and surgical outcomes.

597 Prospective Evaluation of Complications Following ED Extremity Splint Placement in Children and Adults
B. Elizabeth Delasobra1, Emily Siegel1, Ross Levin1, Elizabeth Kaufman1, Kevin Parvaresh2, Rahul Bhat1, John Howell1, and Jonathan E Davis1

Background: Extremity splint placement is a fundamental emergency department (ED) procedure. In practice, this important task may be delegated to providers with varying degrees of experience.

Objectives: Given the lack of prior studies on the topic, we sought to determine the frequency and variety of complications related to extremity splint placement in the ED, and to determine characteristics associated with increased risk for complications.

Methods: A prospective, observational study of adult and pediatric (>7 years old) patients requiring extremity splint placement in the ED. Baseline data included type and location of injury, type of splint placed, provider information (physician, non-physician), and patient co-morbidities. Follow-up was performed one week following ED discharge, and included complications noted during routine follow-up evaluation, non-routine evaluations for splint problems (return visit to ED or other provider), pain associated with splint placement, and any other complications such as fever, skin breakdown, or numbness in the affected extremity. This study was approved by our IRB.

Results: Seventy-one patients were enrolled during a 6-month period, with nine lost to follow-up. Of 62 patients, 11 (18%) experienced complications including numbness (n=6, 10%) and splint-associated skin breakdown (n=5, 8%). Two patients required a repeat ED visit for a splint-related issue. Fifty-nine patients (95%) had their splint placed by ED technicians, with three placed by orthopedic residents. All complications occurred in patients with a splint applied by an ED technician. Complications were not significantly associated with patient co-morbidities (RR=0.6, CI: 0.1–4.1), sex (RR=1.2, CI: 0.4–3.4), extremity affected (RR=0.9, CI: 0.3–2.6), or provider who placed the splint (RR=0.9, CI: 0.2–6). Thirteen pediatric patients were included (range 9–18 years). Two complications were identified in the pediatric subgroup; neither required non-routine follow-up.

Conclusion: Based on the results of this study, minor complications related to ED splint placement are not infrequent. No serious infectious or other complications were identified. Further research is warranted to elucidate patient as well as provider factors associated with the development of complications, as well as potential interventions to reduce the risk of complications.

598 Systematic Review: Comparison of Shoulder Reduction Techniques
Antonia Quinn, Amie Kim, and Richard Sinert
Downstate Medical Center, Brooklyn, NY

Background: A large number of closed reduction techniques for shoulder dislocations have been published.

Objectives: We systematically reviewed the medical literature comparing closed shoulder reduction techniques.

Methods: We searched the OVID and EMBASE databases for randomized controlled trials from 1965 through 11/2010 using a search strategy derived from the following PICO formulation of our clinical question: Patients: patients (18+ years) sustaining anterior shoulder dislocations with or without a humerus fracture. Intervention: novel closed reduction techniques. Comparator: traditional (Hippocratic, Kocher, Stimson, etc.) closed reduction techniques. Inclusion Criteria: prospective randomized comparison of closed shoulder reduction techniques. Exclusion: observational studies without a contemporaneous comparison technique. Qualitative methods were used to summarize the study results. Analysis: success rate was calculated by clinically evident shoulder reduction on the first attempt. Risk ratios between reduction techniques were compared using a forest plot (95% CI) calculated by Revman 5 (Review Manager Version 5.0. The Cochrane Collaboration, 2009).

Results: Our search found 1,196 articles, of which 1,115 were excluded based on title and abstract, 58 were removed because of case reports or review articles, and 21 were removed for lack of a comparator technique. Two studies met inclusion criteria. One study compared Kocher to Milch techniques and the second compared Kocher to the Hippocratic and FARES (Fast Safe and Reliable) techniques. Since different interventions were used with...
different levels of operator expertise, a pooled relative risk was not calculated. Success rates comparing Kocher (72%, 95% CI 60% to 83%) to Milch (70%, 95% CI 57% to 80%) were not significantly different (p=0.89). RR = 0.96 (95% CI 0.76–1.21). FARES (89%, 95% CI 77% to 94%) had a significantly higher success rate compared to Hippocratic (73%, 95% CI 59% to 83%) and Kocher (68%, 95% CI 54% to 79%). FARES vs. Kocher RR= 1.3 (95% CI 1.05 – 1.61), Milch vs. Kocher RR= 1.01 (95% CI 0.89–1.17).

Conclusion: We only found two high-quality studies of closed shoulder reduction techniques with only a single study showing a novel technique (FARES) superior to the Kocher or Hippocratic techniques.

Using the H-index as a Method for Rating Productivity and Impact of Academic Departments of Emergency Medicine

Joy M Hardison, Uwe Stolz, Lawrence DeLuca, Alex St. John, Lincoln Matheson, and Kurt Denninghoff
University of Arizona, Tucson, AZ

Background: Hirsch’s h-index (h) is a tool for measuring the combined academic impact and productivity of a scientist. This approach provides a natural number or index of the number of publications and the number of citations per publication. The h-index was calculated for the EM faculty members in 141 of 147 programs in the United States. Faculty were evaluated individually and then grouped as a total national population as well as by department, and the distribution in each department was compared to the distribution of the entire population of academic emergency physicians. Cumulative percent curves were generated for each department and compared to the entire population of academic emergency physicians. The Poisson distribution of the h-index for a representative strong department was compared to a representative weak department and to the entire population of emergency physicians.

Objectives: To apply the h-index for evaluating academic emergency medicine (EM) departmental productivity and impact.

Methods: Hirsch’s h-index is calculated by counting the number of publications by an author ranked in descending order by number of citations until the paper number equals the number of citations. The h-index was calculated for the EM faculty members in 141 of 147 programs in the United States. Faculty were evaluated individually and then grouped as a total national population as well as by department, and the distribution in each department was compared to the distribution of the entire population of academic emergency physicians. Cumulative percent curves were generated for each department and compared to the entire population of academic emergency physicians. The Poisson distribution of the h-index for a representative strong department was compared to a representative weak department and to the entire population of emergency physicians.

Results: Among all academic emergency physicians, 60% have an h-index of greater than 0. In a strong department 83% of physicians had an h-index of greater than 0, while in a weak department only 39% of physicians had an h-index of greater than 0. Among all academic emergency physicians, 20% have an h-index of greater than 4, compared to 42% in a strong department and merely 8% in a weak department. Among all academic emergency physicians 10% have an h-index of greater than 7, compared to 24% in a strong department and 0% in a weak department.

Conclusion: In addition to the traditional use of h-index as a tool for rating individual faculty, the h-index can be used by department chairs and deans to evaluate the productivity and impact of their departments. Also, emergency physicians seeking faculty positions can use the departmental h-index as a method for assessing desirability of job opportunities.

Influence of Gender on the Evaluation of Resident Professionalism

Gregory Garra, Andrew Wackett, and Henry C Thode Jr
Stony Brook University, Stony Brook, NY

Background: Studies examining the influence of gender on faculty ratings of resident performance are mixed. There are no studies evaluating the effect of gender of nursing ratings of resident performance.

Objectives: Our primary objective was to determine if nurse gender affects the results of multisource feedback (MSF) evaluation. Our secondary objective was to determine if there are other nurse characteristics which affect MSF.

Methods: Study design: Survey. Setting: university emergency department (ED). Subjects: thirty emergency medicine (EM) residents. Measures: an anonymous 9-item MSF was distributed to the ED nursing staff. Evaluators were asked to rate resident professionalism during the encounter on a 1–9 scale (needs improvement to outstanding). Analysis: the mean score for each of the nine questions was calculated for each EM resident. An overall analysis of total resident score was performed using resident gender, EM year and nurse characteristic (gender, age, number of years in nursing practice, nursing shift, nursing degree, and tenure). The primary objective was tested using a resident/nurse gender interaction term. Generalized estimate equations were used to account for clustering effects within nurse ratings.

Results: A total of 1252 MSF evaluations were completed. Scores ranged from a minimum of 9 to maximum of 81. Clustering effects of nurses within residents could not be accounted for across EM years, but were accounted for within EM year. In the full model, there was no evidence of gender bias. Male nurses scored residents approximately two points higher than female nurses (regardless of their own gender). Evaluators scored male residents older than 35 years of age 0.7 points lower than nurses on other shifts. Nurses employed less than a year gave the lowest scores. There were no statistically significant effects of resident gender, EM year, or nursing degree.

Conclusion: We were unable to identify gender bias in our MSF evaluation process. However, older nurses, day shift nurses, and recently employed nurses appear to give lower MSF scores.

Synchronous Collection of Multisource Feedback Evaluations Does Not Increase Inter-rater Reliability

Gregory Garra and Henry C Thode, Jr
Stony Brook University, Stony Brook, NY

Background: Most multisource feedback (MSF) evaluations are performed asynchronously, with raters completing the tool at different times reflecting upon the behavior of the person being rated. Previous studies have already demonstrated a lack of inter-rater reliability.

Objectives: We sought to determine if inter-rater reliability increases when evaluations are gathered synchronously and relate to a specific interaction.

Methods: Study design: survey. Setting: university emergency department (ED). Subjects: thirty emergency medicine (EM) residents. Measures: at the conclusion of a patient encounter, an anonymous 9-item Humanism Scale was distributed to the patient, the ED nurse who cared for the aforementioned patient, and the anonymous 9-item Humanism Scale was distributed to the patient, the ED nurse who cared for the aforementioned patient, and the faculty physician who supervised the care of the aforementioned patient. Evaluators were asked to rate resident professionalism during the encounter on a 1–9 scale (needs improvement to outstanding). Analysis: the mean score for each of the nine questions was calculated for each evaluator class was calculated for each EM resident/nurse interaction term. Generalized estimate equations were used to measure agreement in adjusted scores were between patient, nurse, and faculty evaluations.

Results: Multisource feedback evaluations were obtained in 255 patients. Complete synchronous data were available in 107. The number of evaluations per resident ranged from 1 to 12. The correlations between faculty-nurse and faculty-patient adjusted scores were 0.19 and 0.24, respectively. The correlation between nurse-patient adjusted scores was −0.04. There is a suggestion of lax scoring by all raters. Of faculty physicians, 37 evaluations (35%) had a total score of 72 (all 9s), while 15 (14%) had scores of 64. For nurses, there were 33 (31%) all 9s, 10 (9%) scores of 64, and 6 (6%) scores of 56. For patients (after adjustment), 42 (39%) gave all 9s, there were 10 (9%) 64s and 7 (7%) 56s.

Conclusion: Correlations among the rater classes were not sufficiently strong enough to support synchronous completion of MSF evaluation.

S229
602 A Prediction Rule for Emergency Department Patients With Chronic Obstructive Pulmonary Disease
Ian G Stiell1, Catherine M. Clement2, Brian H. Rowe3, Robert J. Brison4, Eddy Lang5, Bjug Borgundvaag6, Shawn Aaron7, Lisa A. Calder7, Jeffrey J. Perry7, Alan Forster2, and George A. Wells7
1Department of Emergency Medicine, University of Ottawa, Ottawa, ON, Canada; 2Ottawa Hospital Research Institute, Ottawa, ON, Canada; 3University of Alberta, Edmonton, AB, Canada; 4Queen’s University, Kingston, ON, Canada; 5University of Calgary, Calgary, AB, Canada; 6University of Toronto, Toronto, ON, Canada; 7University of Ottawa, Ottawa, ON, Canada

Background: Emergency department (ED) physicians frequently treat and make disposition decisions for patients with acute exacerbations of chronic obstructive pulmonary disease (COPD).

Objectives: To derive a prediction rule to stratify the risk of poor outcomes for COPD patients.

Methods: This multicenter, prospective cohort study was conducted in six academic EDs and included adults who presented with exacerbations of COPD. We assessed patients for 79 standardized clinical and laboratory variables including a structured 3-minute walk test, conducted after treatment. We followed both admitted and discharged patients for serious adverse events (SAEs) which were defined as death, intubation, admission to a monitored unit, or relapse back to the ED requiring admission (SAEs) which were defined as death, intubation, admission to a monitored unit, or relapse back to the ED requiring admission within 14 days. We conducted stepwise logistic regression analyses to calculate adjusted odds ratios for predictors of SAEs and then developed a risk stratification prediction rule.

Results: The characteristics of the 945 study patients were: mean age 72.6, male 51.6%, emergency medical services (EMS) arrival 48.3%, admitted to hospital 37.5%, mortality 1.0%. There were 74 (7.8%) SAE cases, and 36 occurred in patients discharged on the initial ED visit. We developed a multivariate model consisting of 10 predictors (see the Table) with a Hosmer-Lemeshow goodness-of-fit p-value of 0.703 and an area under ROC curve of 0.796 (95% CI 0.74–0.85). Rounding coefficients led to a prediction rule with a fit p-value of 0.703 and an area under ROC curve of 0.796 (95% CI 0.74–0.85). Choosing a risk strata of SAE from 2.2% to 91.4%.

Conclusion: This COPD prediction rule should help ED physicians stratify the risk of poor outcomes for patients with COPD exacerbation and lead to safe, evidence-based disposition decisions. This will improve patient safety and rationalize admission decisions.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Odds</th>
<th>95% C.I.</th>
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<tr>
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<td>1.93</td>
</tr>
<tr>
<td>Heart rate on ED arrival &gt; 110</td>
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<td>0.0003</td>
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</tr>
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603 Vibration Response Imaging Breathing Patterns Differ in Acute Asthmatic Patients Compared to Healthy Subjects
Muhammad Waseem1, Toussaint Reynolds3, Fernando Jara1, and Charles V Pollack Jr2
1Lincoln Medical & Mental Health Center, Bronx, NY; 2Pennsylvania Hospital, University of Pennsylvania, Philadelphia, PA

Background: Vibration response imaging (VRI) is a technique that measures the vibration energy of lung sounds. This technology can be used in diagnosis and severity assessment of lung disease, including asthma, and therefore may be useful in making emergency department (ED) disposition decisions.

Objectives: To compare the VRI breathing pattern in acute asthmatic patients with that of healthy subjects.

Methods: Twelve asthmatic patients (9 males; age 47±12 years) and 15 healthy subjects (12 females; age 56±11 years) underwent evaluation with the VRI. Dynamic development of breathing features (timing, breathing pattern, and synchrony of right and left lungs at peak inspiration/expiration) were evaluated for left and right lungs separately. The presence of wheezes was also identified using the device algorithm.

Results: Dynamic development of the breathing features showed greater variability for asthmatics than for healthy subjects. Timing (101±52 vs. 26±18 msec) and breathing pattern (90±58 vs. 31±5 msec) were significantly different between asthmatics and healthy subjects, respectively (Wilcoxon p<0.001). Additionally, a significantly higher level of inspiratory/expiratory asynchrony was noted between right and left lungs in asthmatics (0.11±0.02 vs. 0.01±0.002 msec; p=0.001). The VRI device algorithm detected abnormal breath sounds in 75% of the asthmatic patients and 7% of healthy subjects (p<0.001).

Conclusion: Respiratory patterns from VRI recordings are significantly different in acutely obstructed asthmatics and in healthy subjects. Detection of non-standard patterns such as asynchrony between the lungs and increased timing to reach peak inspiration, as well as the presence of abnormal breath sounds on VRI recordings, may provide an additional tool to guide the assessment of obstruction and response to therapy in asthmatic patients in the ED.

604 Analysis of Adverse Events in Patients Presenting to the Emergency Department With Acute Respiratory Distress
Austin Gagné1, Ian G. Stiell2, Alan Forster2, and Lisa A Calder2
1Department of Emergency Medicine, University of Ottawa, Ottawa, ON, Canada; 2University of Ottawa, Ottawa, ON, Canada

Background: We have previously shown that patients discharged from high acuity areas of the emergency department (ED) are at increased risk of adverse events (AEs: adverse outcomes associated with health care management).

<table>
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### Treating Moderate Exacerbations of Asthma in the ED Is Associated With Unrecognized Abnormalities in Lactate, Phosphate, Magnesium, and CK-MB Levels

Matthew Koperwas1, Kazuko Matsuda2, Robert Birkhahn3, Luis Lovato4, Richard Nowak2, and Lawrence Lewis1

1Washington University, St. Louis, MO;
2Medinova Incorporated, San Diego, CA;
3New York Methodist Hospital, New York, NY;
4UCLA, Los Angeles, CA;
5Henry Ford Hospital, Detroit, MI

**Background:** There are several reports of significant laboratory abnormalities in hospitalized patients with severe asthma. There are few lab studies of less obstructed individuals who may be discharged or admitted to a general floor.

**Objectives:** Determine if there are significant lab abnormalities in emergency department (ED) patients being treated for moderate asthma exacerbation, and determine if these improve in 24 hours.

**Methods:** A convenience sample of patients with a documented history of asthma presenting to the ED with a moderate acute exacerbation (mean FEV1 34.5) were consented to be enrolled in a structured, piloted process. Data were analyzed with descriptive statistics. AE determinations were made by a trained emergency physician reviewer, using a structured, piloted process. Data were analyzed with descriptive statistics.

**Results:** Of 1200 enrolled patients, there were 68 (5.7%) flagged outcomes and 20 adverse events (1.7%, 95% CI 1.1–2.3). There were 47.1% (n=52/66) female patients and a mean age of 73.8 (SD 9.5). Adverse events occurred among nine patients with COPD, eight with CHF, and three with CPAP. The majority of AEs were preventable (n=18/20, 90.0%). The two most significant types of preventable AEs were unstable disposition decisions (n=9/18) and diagnostic error (n=8/18). One unsafe disposition was a CHF patient sent home despite an ambulatory oxygen saturation less than 90%. In terms of severity among the AEs, there were two deaths, 13 admissions, and five patients who returned to the ED.

**Conclusion:** Patients with CHF, COPD, and CPAP experience a high percentage of preventable AEs, of which an unstable disposition decision or diagnostic error was the primary cause. This suggests a need for improved emergent diagnosis and disposition decision making for these patients.

### Advanced Radiocontrast Dye Injector and Software Program Improve Rate of Suboptimal Studies for Chest Computed Tomography Angiography for Diagnosis in Patients With Suspected Pulmonary Embolism

Benjamin S Katz
Albany Medical Center, Albany, NY

**Background:** Computerized tomography angiography (CTA) of the chest has become a practice standard for evaluation of patients with the suspected diagnosis of pulmonary embolism (PE). In these patients, the radiology interpretation can frequently be found as suboptimal. This may be due to motion artifact, streak artifact, and/or contrast bolus issues. Our prior study revealed an institutional suboptimal rate of 30%. Initial investigation of P3T injector demonstrated a suboptimal rate approaching 0%. Following FDA approval, our institution installed the P3T software in our Stellant CT Contrast Injector in the emergency department (ED) CT suite.

**Objectives:** To determine if the addition of a new CT dye injector software (Medrad P3T) improves the institutional rate of ED patients with CTA to exclude PE with a radiology impression of suboptimal.

**Methods:** This investigation reviewed a prospective cohort of ED patients evaluated during two 3-month periods with CTA of the chest to exclude PE before and after the installation of the P3T injector and software. Patient visits were categorized as positive for PE, negative for PE, or suboptimal. Suboptimal studies were further classified as due to contrast bolus timing, motion artifact, streak artifact, and other (attributed to body habitus or other technical issues). Data were analyzed using bivariate statistics.

**Results:** The study population consisted of 537 ED patients evaluated for PE. Prior to installation of P3T, 281 patients were enrolled with a suboptimal rate of 30% (n=83). After installation of P3T, 256 patients were enrolled with a suboptimal rate of 12% (n=31) (LR 3.04 for improved study, 95% CI 1.93–4.79). Reasons for suboptimal studies shifted between the two groups: contrast bolus timing changed from 9.3% (26) to 3.1% (8), streak artifact from 2.5% (7) to 0.4% (1), other from 8.9% (25) to 1.5% (4) (p<0.01); but motion artifact was stable at 8.9% (25) and 9% (18). Of the patients with suboptimal studies due to contrast bolus timing after P3T installation, 5 of 8 patients were injected through a smaller gauge IV. IV size was found to affect the study quality with a likelihood ratio of 9.7 (p<0.05).

**Conclusion:** Installation of P3T injector and software resulted in a significant reduction in suboptimal CTA for PE. The subgroups most affected were contrast bolus timing, streak artifact, and body habitus.

### Contrast CT Scans in the Emergency Department: Is There Really an Increased Risk of Adverse Clinical Outcomes?

Michael Heller, Gregg Husk, Wendy Bowers, Doug Finefrock, Thomas Nguyen, Tiffany Cohen, Justin Allen, Kar-Mun Woo, Patricia Friedman, and Saadia Akhtar
Beth Israel Medical Center, NY, New York, NY

**Background:** Contrast-induced nephropathy (CIN) has received much attention in both the emergency medicine (EM) and non-EM literature. Almost all studies have used as an endpoint a small...
increase in the serum creatinine (Cr) of questionable clinical
importance.

Objectives: The primary objective of this retrospective, con-
trolled, computerized chart review was to determine the incidence
of adverse patient-oriented outcomes in patients receiving IV con-
trast compared to demographically matched emergency depart-
ment (ED) patients not receiving contrast. Our hypothesis was that
there would be no increase in death or dialysis among patients
receiving IV contrast.

Methods: The study group consisted of all ED patients in the last
5 years (2005-2010) who were admitted and received both IV con-
trast in the ED for CT imaging (abdomen or chest) with at least one
serum Cr in the ED prior to the study and one more in the ensuing
96 hours. We then compared these to a contemporaneous control
group of admitted ED patients who received a chest or abdominal
CT without IV contrast and also had a Cr measured pre- and post-
study over the same time frame. The incidence of CIN, defined as an
increase in Cr of 25%, for each group, was calculated and compared.
We also compared the incidence of two adverse patient-
oriented outcomes, death and dialysis, in the two groups.

Results: Of 6,954 patients in the contrast group, 598 (8.6%) had
CIN compared with 87/908 (9.6%) in the non-contrast CT group (P =
0.32); the contrast group exhibiting a non-significant 10% lower
incidence of CIN-defining Cr rise than did the controls. There were
no instances of dialysis in the 909 patients in the non-contrast group
versus 16 dialysis patients in the 6954 patients receiving contrast (p
=0.148). Of those 16 patients, 11 died (68% mortality) and only one
was discharged to independent home living. There were a total of
11 deaths in the 908 non-contrast patients compared with 106 in the
6954 receiving contrast (1.2% vs. 1.5% p=0.24).

Conclusion: Patients receiving contrast for abdomen and chest
CTs were not at increased risk for small increases in Cr, nor was
their overall risk of death or dialysis significantly worse than their
non-contrast counterparts. The apparent high morbidity and mor-
tility in the contrast group who require dialysis may merit further
study.

CT Scan With IV Contrast Alone: The Role of Intra-abdominal Fat (IAF) on the Ability to
Visualize the Normal Appendix

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Vaseem Iqbal5, Carla V Quijano6, Kathleen M Adelgais7, Sandra L Wootton-Gorges8, Sudha
A Anupindi9, Sushil Sonavane10, Aparna Joshi11, Murugusundaram Vearamani12,
Shireen M Atabaki13, David J Monroe14, Stephen M Blumberg15, Carrie B Ruzal-Shapiro16, and
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Background: Oral contrast is frequently used as part of CT
protocols to evaluate children with suspected appendicitis. Chil-
dren are felt to lack the intra-abdominal fat (IAF) necessary to
assure CT accuracy if enteral contrast is not used.

Objectives: (1) Determine the sensitivity of CT with IV contrast
alone (CT IV) for visualizing the normal appendix, (2) determine if
the adequacy of IAF affects CT IV sensitivity, and (3) define patient
characteristics that are associated with adequate IAF in children.

Methods: Radiologists reviewed abdominal CT scans from an
existing PECARN database of children with blunt abdominal
trauma. We included children 3 to 18 years for whom actual
weight was available, prior history of appendectomy was known,
and CT IV was available. We performed those with intra-abdom-
inal injury. Radiologists blinded to patient history rated patient
IAF as adequate (IAF+) or inadequate (IAF-) and assessed the CT
for presence or absence of the appendix. We performed bivariate
analyses to assess the association of age, weight, and sex with ade-
quate IAF.

Results: Two hundred and eighty patients were assessed, with
a mean age of 10.6 yrs (range 3.1-17.9 y); 171 (61.1%) were male. All
280 had no prior appendectomy. One hundred and two (36.4%)
patients were judged to have adequate IAF on CT. Radiologists
visualized the appendix in 204/280 patients (CT IV sensitivity
72.9%, 95% CI 67.6%, 78.1%). CT IV sensitivity was higher in those
with IAF+ compared to the IAF- group (89% v. 63%, p < 0.001). Patients in the IAF+ group were older (mean age 11.6 vs. 10.0 yrs,
p=0.002) and heavier (median weight 47.8 vs. 33.0 kg, p<0.001).
Additionally, females were more likely to have adequate IAF than
males (44% v. 31.6%, p=0.035).

Conclusion: CT IV is sensitive to detect the appendix in those
with adequate IAF. Consideration should be given to patient sex,
age, and weight when determining which children might be able
to forgo enteral contrast when evaluated for appendicitis.


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Background: The utilization of computed tomography (CT) in
emergency medicine has increased dramatically over the past 10
years.

Objectives: In this study we estimate the increase in population
exposure to radiation attributable to increased CT utilization in
emergency departments (EDs), and explore its impact on x-ray uti-
lization, hospital admission rates, and ED length of stay.

Methods: We performed a retrospective analysis of a nationally
representative sample of 540,549 adult ED visits from the National
Hospital Ambulatory Medical Care Survey (NHAMCS), 1998 to
2008. Visit rates were calculated using United States census esti-
mates. Temporal trends and factors associated with CT use were
analyzed using bivariate and multivariate logistic regression analy-
ses. We used an estimate of 5 milli Sieverts (mSv) for a typical radia-
tion dose from a single CT for an adult.

Results: The annual exposure of the U.S. population to CTs
performed in U.S. EDs more than tripled from 18 CTs per 1,000
persons in 1998 to 71 CTs per 1,000 persons in 2008 (308% increase;
P<0.001), reflecting an increase in the number of CT images per-
formed from approximately 3.5 million CTs in 1998 to 16.4 million
CTs in 2008. Ninety-six percent of this increase was attributable to
increases in CT ordering in the ED and 4% was due to increases in
ED visit rates. The increased radiation exposure associated with
this increase in CT utilization is 265 mSv per 1,000 persons which is
the equivalent of each person in the US receiving an additional 13
chest x-rays each year. Despite the increased use of CT imaging,
there was no significant change in the use of x-ray imaging
were blinded to the gas used. Hypoxia was defined as an SpO2 of
followed by 0.5 mg/Kg titrated to effect. Physicians and patients
mask, before and during PSA. Propofol was dosed at 1.0 mg/Kg,
100% oxygen or compressed air at 15 L/min, via non-rebreather

High flow oxygen reduces the incidence of hypoxia
One hundred and eighty-nine patients were screened,
Results:
Methods:
Objectives:
To determine if high flow oxygen reduces the incidence of hypoxia by 20%, compared to room air, in patients receiving propofol for ED PSA.

Methods: Patients were randomized to receive 5 minutes of 100% oxygen or compressed air at 15 L/min, via non-rebreather mask, before and during PSA. Propofol was dosed at 1.0 mg/kg, followed by 0.5 mg/Kg titrated to effect. Physicians and patients were blinded to the gas used. Hypoxia was defined as an SpO2 of ≥93%; respiratory depression was defined as an ETCO2 level of ≥50 mmHg, a 10% absolute change from baseline, or loss of the CO2 waveform

Results: One hundred and eighty-nine patients were screened, 119 enrolled, and 13 patients were excluded after enrollment due to protocol violations (4) or greater than 35% data loss (9). Of the 106 patients analyzed, 55 received high flow oxygen and 51 compressed air. 11/55 (20%) high flow oxygen and 21/51 (41%) compressed air patients experienced hypoxia (effect size 21%, 95% CI 1.5 to 31%, p=0.019). 28/55 (51%) high flow oxygen and 28/51 (55%) compressed air patients met criteria for respiratory depression (effect size 4%, 95% CI -15 to 22%). There were four adverse events (one assisted ventilation, one bradycardia, two episodes of hypotension).

Conclusion: High flow oxygen reduces the incidence of hypoxia during propofol sedation by 21% compared to compressed air. Patients had similar rates of respiratory depression. Physicians should consider using supplemental high flow oxygen during ED PSA with propofol to minimize the incidence of a hypoxic event.

Combined Ketamine and Propofol Sedation Vs Propofol Sedation for Emergency Department Procedures: A Prospective Randomized Trial
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Background: Ketofol is suggested as an ideal agent for procedural sedation. Its relative safety and efficacy compared to propofol is unclear.
Background: Ketofol is a combination of propofol and ketamine that has been described for deep procedural sedation (PS).

Objectives: To compare propofol to ketofol for PS. We hypothesize there is no difference in the time of the procedure, the need for supportive airway measures (SAM), or the patient’s perception of pain or recall of the procedure between PS using propofol and ketofol.

Methods: This was a randomized, blinded, three- Arm clinical trial of adult patients (age=18) undergoing PS in the emergency department (ED). Patients were randomized to receive propofol 1 mg/kg (PRP), ketamine 0.5 mg/kg combined with propofol 0.5 mg/kg (1:1), or propofol 0.8 mg/kg combined with ketamine 0.2 mg/kg (4:1) in an IV bolus, followed by half of the initial dose every 3 minutes as needed for sedation. Doses, vital signs, end-tidal CO$_2$ (EtCO$_2$), and pulse oximetry were recorded. SAM used during the procedure (bag-valve mask use, airway repositioning, increased supplemental oxygen, or stimulation to induce respiration) and hypoxia (O$_2$ sat<93%) were recorded. The occurrence of emergence phenomena (EP) and the time of the procedure were recorded. Post procedure, patients were asked to report any pain or recall of the procedure. Data were compared using Kruskal Wallis and chi-square tests.

Results: Forty-six patients were enrolled, 16 received PRP, 12 received 1:1, and 18 received 4:1. No significant adverse events were noted. The median total dose of propofol was 0.14 mg/kg (range 0.08 to 0.27) for PRP, 0.05 mg/kg (range 0.04 to 0.15) for 1:1, and 0.15 mg/kg (range 0.05 to 0.26) for 4:1, and of ketamine was 0.05 mg/kg (range 0.04 to 0.15) for 1:1, and 0.03 mg/kg (range 0.01 to 0.07) for 4:1 (p=0.74). The median time of the procedure was 9.5 minutes (range 5 to 16) for PRP, 19 minutes (range 10 to 31) for 1:1, and 15 minutes (range 10 to 27) for 4:1 (p=0.02). SAMs were noted in 2/16 (13%) for PRP, 1/12 (8%) for 1:1, and 4/18 (22%) for 4:1 (p=0.50). 6/16 (38%) PRP patients, 1/12 (8%) 1:1 patients, and 1/18 (6%) 4:1 patients reported pain with or recall of the procedure (p=0.24). An O$_2$ sat<92% (83%) was seen in one patient in the 4:1 group and 0 patients in the other two groups (p=0.44). EP were seen in 2/16 in the PRP group, 2/12 in the 1:1 group, and 4/18 in the 4:1 group (p=0.79).

Conclusion: We did not detect a difference in hypoxia, SAM, or EP. The time of the procedure was longer in the 1:1 and 4:1 groups than in the propofol group. The three groups appear to be safe approaches to PS. (Originally Submitted as a “Late-breaker”)

Results: Five hundred and twenty-five consecutive patients receiving PSA for I&D were prospectively evaluated: 244 IDUs and 281 non-IDUs. Among IDUs, there were 10 AEs requiring physician intervention while there were seven in the non-IDU group. Median recovery times were 18 minutes (IQR 10, 36) for IDUs and 12 minutes (IQR 7, 19) for non-IDUs (p < 0.0001). For IDUs, ED LOS was 219 minutes, while non-admitted non-IDUs had an ED LOS of 194 minutes (p = 0.002, H = 9.2).

Conclusion: Injection drug users do not appear to have a higher rate of PSA adverse events than non-IDUs, but recovery times and LOS are longer. PSA appears to be safe and effective in this high-risk population.

614 Adverse Event Profile of Different Procedural Sedation and Analgesia Regimens in Injection Drug Users: A Prospective Comparison

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Background: Injection drug users (IDUs) often require procedural sedation and analgesia (PSA) as part of emergency department (ED) treatment, but the optimal sedation strategy remains unclear in this high-risk group.

Objectives: We compared adverse event (AE) rates in different PSA regimens.

Methods: As part of a safety audit, IDU status was documented among consecutive patients undergoing PSA at two urban EDs from April 1, 2006 to January 31, 2009. Structured data describing comorbidities, vital signs, sedation regimens, and medical treatments were collected, along with prespecified AEs. PSA regimens consisted of propofol (PR), fentanyl-midazolam (FM), and ketamine-propofol (KP). Primary outcome was rate of AE requiring physician intervention; secondary outcomes included recovery time and ED length of stay (LOS), stratified by sedation regimen.

Results: Two hundred and sixty-nine consecutive IDUs were prospectively evaluated. One hundred and fifty-five received PR, 65 FM, and 49 KP. Ages, vital signs, and procedures were similar in each group. There were three AEs in the PR group (0.9%, 95% CI 0 - 2.7%), six in the FM group (4.6%, 95% CI 0 - 10.9%), and four in the KP group (7.6%, 95% CI 0 - 17.9%). For primary outcome, p = 0.05 between groups. No AE changed patient disposition. Median recovery times were: PR 25 (IQR 17–36) minutes, FM 28 (IQR 20–58) minutes, and KP 30 (IQR 17–60) minutes (p = 0.07, H = 5.49). Median ED LOS was 3.6 (IQR 2.4 - 4.3) hours, 4.3 (IQR 3.1 - 5.0) hours, and 4.1 (IQR 3.1 - 5.7) hours, respectively. (p = 0.005, H = 10.6)

Conclusion: All three regimens for PSA in IDU resulted in few adverse events, none changing disposition. Patients receiving PR appeared to have more rapid recovery and shorter LOS times.
Comparison of Diltiazem and Metoprolol in the Management of Atrial Fibrillation or Flutter With Rapid Ventricular Rate in the Emergency Department: A Prospective, Randomized, Double-blind Trial

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Background: The recommended approach to ventricular rate control in atrial fibrillation or flutter with preserved left ventricular function is use of either a beta-blocker or a calcium channel blocker.

Objectives: The purpose of this study was to compare the effectiveness of intravenous metoprolol with that of diltiazem in achieving rate control (HR <100 bpm) in patients presenting to the emergency department (ED) with atrial fibrillation or flutter with rapid ventricular rate (HR >120 bpm).

Methods: This was a prospective, randomized, double-blind trial conducted in the adult ED of an urban teaching hospital. The primary outcome was heart rate <100 bpm within 30 minutes. If the subject presented with SVT, adenosine was used to diagnose the underlying tachydysrhythmia. HR measurements were collected at one-hour lecture, 10 sedations supervised by an emergency physician (EP), and a written test. All patients were monitored by pulse oximetry. Patients received supplemental oxygen by nasal cannula when available. Ketamine was given IM or IV, at the discretion of the nurse performing the sedation. Sedations were observed by a research associate, who prospectively recorded data on demographics, dosing, safety procedures, and complications.

Results: One hundred and eighteen patients received 191 sedations over 4 months. Each nurse performed 30 to 36 independent sedations during the study period. Indications for sedation included abscess drainage, fracture/dislocation reduction, burn/wound care, foreign body removal, and lumbar puncture. Patient age ranged from 4 months to 78 years, with 18% younger than 2 years and 51% under 18 years. There was an 18.3% rate of minor complications (desaturation below 90% for ≥15 seconds, apnea, vomiting, emergence reactions, and hypersalivation requiring suctioning). There were no major complications (need for bag-valve-mask, unanticipated admission to the hospital, death). The one-sided 97.5% confidence interval for major complications is 0–1.91%. The nurse leading the sedation promptly managed all complications except one episode of desaturation that lasted 17 seconds. The nadir SaO2 was 87% and resolved spontaneously, but the nurse did not reposition the head or increase the flow of oxygen.

Conclusion: After brief training, nurse-administered ketamine sedation in resource-limited settings appears to be both safe and effective.

617 Development Of A Symptom-Specific Quality Of Life Scale In Emergency Department Patients With Recent Onset Atrial Fibrillation/Flutter

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Background: While recent-onset atrial fibrillation/flutter (RAFF) is the most common arrhythmia requiring management in the emergency department (ED), there is no validated disease-specific scale to quantify symptom severity.

Objectives: The purpose of this study was to develop a symptom-specific quality of life (QoL) measure, as both a clinical and research tool, for patients presenting to the ED with RAFF.

Methods: We conducted a prospective cohort study in the EDs of two large university hospitals and enrolled adult patients presenting with palpitations. We adapted the ED RAFF Scale from the Canadian Cardiovascular Society Severity of AF Scale and created seven symptom questions. Patients were asked to rate the severity of each symptom on a numerical rating scale from 0 to 10, with 0 being “none” and 10 being “worst possible”. Patients provided written consent and then completed the ED RAFF Scale and the SF-8 QoL Scale at time 0 and again at 15 minutes. Patients were randomized to self-administered or to clinician-administered scales at time 0 before crossing over at time 15. We compared results with Student’s t-test.

Results: We enrolled 41 patients: male 58.8%, mean age 61.2 years, mean duration symptoms 11.7 hours, prior history RAFF 51.5%. Individual items on the RAFF Scale had these means (SD): palpitations 2.8 (2.7), lightheadedness 2.0 (2.4), chest pain 18 (1.0), shortness of breath 2.2 (2.5), shortness of breath with exertion 6.3 (2.8), fatigue 3.9 (3.1), and fatigue with exertion 6.7 (2.8). There was no difference between scores for self vs. clinician administration (all p-values >0.40). Mean scores for the generic SF-8 scale were 34.7 for physical and 42.9 for mental, but there was low correlation with the RAFF scores.

Conclusion: The ED RAFF Scale is the first disease-specific QoL measure for use in ED patients with RAFF, and showed good dispersion and stability, whether self- or clinician-administered. This scale will be used to judge the immediate and short-term success of management strategies.

% Reached Heart Rate < 100 bpm

<table>
<thead>
<tr>
<th></th>
<th>Metoprolol (n=28)</th>
<th>Diltiazem (n=24)</th>
<th>P-Value</th>
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</thead>
<tbody>
<tr>
<td>At 5 Minutes</td>
<td>10.7%</td>
<td>50.0%</td>
<td>0.002</td>
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<tr>
<td>At 10 Minutes</td>
<td>17.9%</td>
<td>70.8%</td>
<td>0.0001</td>
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<tr>
<td>At 15 Minutes</td>
<td>32.1%</td>
<td>76.0%</td>
<td>0.002</td>
</tr>
<tr>
<td>At 20 Minutes</td>
<td>35.7%</td>
<td>83.3%</td>
<td>0.001</td>
</tr>
<tr>
<td>At 25 Minutes</td>
<td>42.9%</td>
<td>91.7%</td>
<td>0.0001</td>
</tr>
<tr>
<td>At 30 Minutes</td>
<td>46.4%</td>
<td>95.8%</td>
<td>0.0001</td>
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Evaluation of Etiologies and Therapeutic Strategies in Hypotensive Patients With Atrial Fibrillation and Rapid Ventricular Response

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Background: Atrial fibrillation with rapid ventricular response (RAF) is a common presentation in the emergency department (ED). AHA/ACLS guidelines for unstable RAF recommend immediate electrical cardioversion.

Objectives: We hypothesized that a majority of patients with RAF and hypotension do not have a primary cardiac etiology and, therefore, cardioversion is often not used or not successful as first line therapy.

Methods: Retrospective chart review of patients with RAF and hypotension in the ED of a tertiary care center from 2007–2008. RAF was determined by an EKG documenting AF with a rate >110/min. Hypotension was defined as SBP less than 90 mmHg.

Results: We evaluated 44 patients with RAF and hypotension. Mean age was 76 +/- 14 years. Mean heart rate was 140 +/- 20 bpm. The primary etiology of RAF was sepsis in 25 (56.8%), primary cardiac in 11 (25%), hypovolemia in 7 (15.9%), and other in 1 (2.3%). First-line therapy was IV saline in 34 patients (77.3%), calcium channel/beta-blockade in 8 patients (18.2%), cardioversion in 1 patient (2.3%), and vasopressors in 1 patient (2.3%). Six (13.6%) ultimately were cardioverted with resolution of hypotension in only 2/6 (33%). Vasopressors were ultimately used in 14 patients (31.8%). In a sub-set of patients with HR >130 (n=33), the etiologies, therapies, and success rates were statistically non-significant when compared to the total group (p value for all tests > 0.05).

Conclusion: The most common etiology of RAF with hypotension presenting to the ED was sepsis rather than primary cardiac, and intravenous volume was first-line therapy in the majority of cases. Only a small number of these patients were cardioverted, with the majority failing to resolve hypotension with this intervention. ED physicians need to be prepared for measures other than cardioversion for patients with unstable RAF.
patient were calculated for both groups. A two-tailed t-test was used in analysis.

**Results:** Admission diagnosis was categorized into diagnostic groups: pulmonary = 18%, Gl = 17%, cardiac= 19%, neuro= 13%, sepsis/infection = 7%, and other = 26%. There was no statistical difference (mean RVU difference = 0.097, p=0.48) between EMR (mean = 3.56) and DMR (mean = 3.65) RVUs in ED admissions of MICU patients over the time period evaluated.

**Conclusion:** Emergency department use of EMR does not improve documentation quality over dictation when RVUs are examined as surrogate markers of quality. This study did not evaluate provider time requirements, satisfaction, or individual variability in EMR documentation.

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### 621 Evaluating the Impact of Introducing an Electronic Charting System on Resident Productivity

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**Beth Israel Deaconess Medical Center, Boston, MA**

**Background:** Electronic charting (EC) is becoming the standard in United States hospitals. Introducing EC to an academic emergency department (ED) has the potential to slow residents’ ability to evaluate patients, although not studied previously. Decreasing resident productivity (RP) would affect both ED flow and resident education, as each patient encounter contributes to the educational experience. This study evaluates how the introduction of EC to an academic ED affected RP.

**Objectives:** To determine if EC is an obstacle to ED flow and resident education.

**Methods:** A retrospective review of shift data for emergency medicine (EM) interns from an academic, tertiary care center with 55,000 annual visits was performed. A mandatory EC system was instituted at the start of the 2010 academic year, July 1. No 2009 interns (EM09) and all 2010 interns (EM10) used the electronic chart. Shift data, including the number of primary, admitted primary, and inherited patients, were abstracted from computer records and matched to resident schedules from the first three months of the academic year. Shifts from higher-acuity and lower-acuity zones were compared separately. Student’s t-test was used to test evaluate RP difference for EM09 and EM10.

**Results:** Six hundred and forty-five shifts were reviewed: 138 EM09 and 194 EM10 high-acuity shifts and 136 EM09 and 177 EM10 low-acuity shifts. The mean number of patients seen primarily per high-acuity shift were statistically similar (6.60 for EM09 and 6.29 for EM10, p = 0.12), while admissions and inherited patients remained statistically similar between EM09 and EM10 (admissions 3.35 and 3.47, p = 0.48 and inherited patients 5.30 and 5.85, p = 0.11, for EM09 and EM10, respectively). There was a statistically significant increase in patients per low-acuity shift from EM09 to EM10 (12.06 and 13.54, p < 0.001), despite an increase in admissions (2.79 and 3.24, p < 0.02), and similar inherited patient rates (1.94 and 1.94, p = 0.99).

**Conclusion:** Despite the initial concern that EC would decrease RP, the institution of an electronic charting system did not significantly decrease the RP of EM interns. RP remained similar in the higher acuity zone, and actually increased for lower-acuity patients. These findings were observed in the context of statistically similar or increased admission rates and similar numbers of patients inherited for EM10. This study suggests that an EC system does not inhibit RP.

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### 622 Recognition of Wrong-Patient Errors in a Simulated Computerized Provider Order Entry System

**Aaron Z Hettinger and Rollin J. Fairbanks**  
**Washington Hospital Center/MedStar, Washington, DC**

**Background:** Computerized provider order entry (CPOE) systems have the potential to improve patient care in emergency medicine, but it is unclear how interface design can affect error rates.

**Objectives:** The objective of this study was to determine if the addition of contextual information to a CPOE interface improves provider recognition and correction of patient selection errors, also known as “wrong-patient” errors, for emergency department (ED) radiology orders.

**Methods:** Forty-six emergency medicine providers were randomly assigned to three groups (standard design, bolded patient identifiers, and contextual information) using a between-subjects design. Each participant navigated through three scenarios, ordering radiology studies in a simulation of an existing CPOE system. A “wrong-patient” event took place significantly more often in the data entry phase, which suggests this is where efforts should be focused. In this preliminary study there was no significant effect from the addition of contextual information to the ordering screen. Further study is needed to determine the most effective intervention to reduce the wrong-patient order hazard.

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### 623 Prospective Evaluation of the Treatment of Pain in the Emergency Department Using Computerized Physician Order Entry

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**University of Utah, Salt Lake City, UT**

**Background:** Treatment of pain in the emergency department (ED) is a significant area of focus in the care of ED patients. Previous studies have noted inadequate treatment of pain in ED patients. Computerized physician order entry (CPOE) has been found to improve several areas of patient care; however, previous studies have not evaluated the effect of CPOE on the treatment of pain in the ED.

**Objectives:** We sought to evaluate treatment of pain before and after implementation of CPOE in an academic ED.

**Methods:** We implemented CPOE in our ED in November 2009. We prospectively enrolled a convenience sample of patients presenting to the ED with a pain-related complaint in four-month periods before and after CPOE implementation: January-April 2009 (pre-CPOE) and January-April 2010 (post-CPOE). Prior to implementation of CPOE, all physician orders were written on a paper order sheet on the patient’s chart, while CPOE uses order sets related to the patient’s presenting complaint as well as standing orders for pain medication dosing. We compared numbers who received pain medication, time to pain medication, repeat dosing of pain medication, and patients’ overall satisfaction with the treatment of their pain during their ED visit.

**Results:** 1,238 ED patients with pain-related complaints agreed to participate in the study. Six hundred and forty-six ED patients participated in the pre-CPOE period while 592 patients participated post-CPOE. Similar numbers of patients received pain medications in the pre- and post-CPOE periods (55% vs. 50%, p<0.139), while those in the post-CPOE period were more likely to receive a repeat dose of pain medications (10.5% vs. 17.6%, p<0.001). The time to the initial dose of pain medications was not significantly different between the two periods (82 minutes vs. 89 minutes,
624 Do Emergency Department Providers Accurately Document Patient Identification Errors Made During Computerized Provider Order Entry?

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Background: The study of medical errors is often limited by inconsistent voluntary provider reports. Rapidly canceled orders within a CPOE (computerized provider order entry) system often represent “near miss” errors.

Objectives: We hypothesized that a significant proportion of patient identification errors (PIEs) during CPOE are not accurately documented by providers, and that attending physicians are less likely than residents to accurately self-report PIEs.

Methods: In our emergency department’s (ED’s) CPOE system, the ordering provider selects a patient from an array on a tracking board. Upon order cancelation, the CPOE system forces the provider to select a reason for cancelation from a pick list. We classified a canceled order as being a truly documented PIE if the provider selected “wrong patient.” We also classified a PIE as truly documented if the provider chose “item entered in error”, and subsequently wrote an identical order on a different patient within 3 minutes of order cancelation. An order cancelation was considered to be a falsely documented PIE if the provider chose “change in treatment plan” or “duplicate order”, wrote an identical order on a different patient within 3 minutes of canceling, and there was no other similar order on the original patient. We compared falsely documented PIE rates for attending physicians and residents.

Results: In one year, 9% of the 106,325 medications or CT orders were canceled, and 4.8% of these cancelations were PIEs. Fifteen percent of PIEs were falsely documented, with the majority of these (80%) contributed by only 25% of providers. These falsely documented PIEs were instead claimed to be due to a “change in treatment plan” (81%) or “duplicate order” (19%). Attending physicians had a higher rate of falsely documented PIEs than residents (P = 0.06). Every ED provider with more than 2,000 orders had at least one PIE.

Conclusions: Most recognized PIEs are accurately documented by ED residents and attending physicians. ED providers occasionally falsely document a PIE as a duplicate order or change in treatment plan. Most falsely documented PIEs were authored by a handful of ED residents and attending physicians. Forcing functions in CPOE systems may help identify unreported provider errors.

625 Patient Identification Errors in an Emergency Department Using Computerized Provider Order Entry

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Beth Israel Medical Center, New York, NY

Background: Patient identification errors in the emergency department (ED) have long been recognized as a potential threat to patient safety. The juxtaposition of multiple patient names on a single computer screen may facilitate such errors during computerized provider order entry (CPOE), with little available data as to what factors affect the incidence of such errors.

Objectives: We hypothesized that patient identification errors would be less common in ED attending physicians than residents, that residents working overnight shifts would be more likely to make this error than residents on day and evening shifts, and that this mistake would be less frequent during CPOE of high-risk (rather than low-risk) medications.

Methods: The CPOE system used in our busy urban teaching ED requires the clinician who wishes to cancel an order to select a reason for the cancellation from a drop-down list. We studied the characteristics of the providers and orders when the reason selected was “wrong patient.”

Results: Of 334,701 orders by residents or attendings entered in a one year period, 25,126 (7.5%) were cancelled, out of which only

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<th>Truly vs. Falsely Documented Patient Identification Errors</th>
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<td><strong>Residents’ Truly Documented PIEs/Total PIEs</strong></td>
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<td>High Risk Medication Orders</td>
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<th>“Wrong Patient” Error Rates</th>
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<td><strong>Residents</strong></td>
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<td>Acetaminophen</td>
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<td>High Risk Medications (insulin, IV narcotics, heparins)</td>
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Impact of a Phone Call Follow-up on Discharge Instruction Compliance and Understanding in Elderly Patients After an Emergency Department Visit

Kevin Biese, Michael LaMantia, Fran Shofer, Brenda McCall, John S Kizer, and Jan Busby-Whitehead

University of North Carolina at Chapel Hill, Chapel Hill, NC.

Background: Older patients seen in the emergency department (ED) are at high risk of functional decline and return visits. Improved compliance with discharge instructions may improve outcomes.

Objectives: We hypothesized that a simple phone call 1–3 days following an ED visit would improve outpatient follow-up and medication management in elderly patients discharged home from the ED.

Methods: We conducted a randomized, controlled trial of patients age 65 and older discharged to home from an academic ED. During a 10 week period, patients were randomly assigned to one of the following groups at 1–3 days after ED visit: 1) an intervention group (IG) that received a phone call from a trained nurse to review discharge instructions; 2) a non-intervention group (NG) that was not informed of our intention to call; or 3) a control group (CG) that received no phone call. All patients received a call at 5–8 days after ED visit to measure compliance with discharge instructions including follow-up and medications. Patients were excluded if they returned to an ED or were admitted to a hospital within 5–8 days post ED visit. To determine differences between groups with regard to follow-up visits and medication changes, chi-square tests were performed.

Results: Of 177 potential patients, 14 met exclusion criteria. Of the remaining 163 patients, 121 (74%) consented and were able to complete the study. Patients were 60% female, 72% white, with a mean age of 75 years. IG patients were more likely to follow up with a medical provider within 5 days of the ED visit than either NG or CG patients (61%, 23%, 37%, respectively, p=0.04). Compared to CG patients, IG and NG patients were more likely to pick up prescribed/recommended medications (86% vs. 80%), know the name and dosage of their medication (86% vs. 76%), and know the reason for taking the medication (92% vs. 84%, p=0.03 for all).

Conclusion: Phone call follow-up of ED elderly patients discharged to home is a feasible intervention that resulted in patients being seen more quickly for follow-up appointments and may have a role in helping patients understand and manage their medications. Further study is warranted to determine if these results translate into improved patient outcomes and decreased return visits to the ED.

Patient Comprehension of Emergency Department Discharge Instructions: Where Are the Deficits Greatest?

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Background: Many discharged patients lack complete comprehension of their emergency department (ED) care and instructions. Patients have demonstrated particular difficulty in understanding post-ED care instructions (including medications, home care, and follow-up).

Objectives: The objective of this study was to further examine these deficits by focusing on common ED diagnoses with well-established discharge information and assessing comprehension for each distinct aspect of the discharge instructions.

Methods: We conducted a cross-sectional, phone interview-based study of 141 adult English-speaking patients within 24–36
hours of ED discharge. Patient comprehension was assessed for five diagnoses (ankle sprain, back pain, head injury, kidney stone, and laceration) across the following five categories: diagnosis, medications, home care, follow-up, and return instructions. Comprehension was determined based on the concordance between direct patient recall and diagnosis-specific discharge instructions combined with chart review. Two authors scored each case independently and discussed discrepancies before providing a final score for each category (no, minimal, partial, or complete comprehension). We used descriptive statistics for the analyses.

**Results:** Fifty percent of patients were female and the average age was 44 years old. Over 80% of patients demonstrated comprehension deficits for the category of home care instructions and nearly 75% exhibited incomplete comprehension of return instructions. Less frequent deficits were found for the categories of follow-up (38%), medications (21%), and diagnosis (13%). More than two-thirds of participants demonstrated minimal or no comprehension in at least one category. Minimal or no comprehension was found in 42% of cases for home care and 50% of cases for return instructions, but occurred much less frequently for the categories of follow-up (18%), diagnosis (3%), and medications (3%).

**Conclusion:** Patients demonstrate the greatest difficulty recalling home care and return instructions, raising significant concerns for adherence and outcomes. Future work will evaluate differences across the five chosen diagnoses and consider strategies and interventions to address comprehension deficits.

**Prevalence of Cell Phones Capable of Receiving Discharge Information Among Patients Presenting to an Urban Emergency Department**

Lauren K. Shaw, Rajneesh Gulati, Ashley Colucci, Nancy Kwon, Yusaku Kasuaharu, Amal El Bakhar, Erica Simon, and Stephen P. Wall

**Background:**

Patients presenting to emergency departments (EDs) often fail to understand discharge instructions. This is in part due to instructions given, either verbally or printed, to a population incapable of understanding them. Multimedia-based discharge instructions have been advocated to address this need, but only for those having means to view such content.

**Objectives:**

We sought to determine the prevalence of cell phones capable of receiving multimedia discharge information among patients presenting to an urban ED.

**Methods:**

A random sample of patients and visitors who presented to an urban teaching hospital’s adult and pediatric ED (annual volume of 108,695) was surveyed. Trained surveyors approached subjects, determined eligibility, and obtained verbal informed consent to participate. Eligibility was based on age 18 years or greater and ability to provide informed verbal consent. Subjects verbally provided responses to questions read aloud by the interviewers in their primary language using a certified translator when appropriate. The primary outcome was proportion of subjects having cell phones capable of receiving discharge information with them in the ED. Secondary outcomes included capability for other mobile messaging (video and text) and whether such services were activated.

**Results:** In total, 1,303 subjects were approached during the randomized sampling sessions; 67% (873) met eligibility criteria and 71% (617) of those agreed to participate. Of these, 82% owned a cell phone (95% CI 0.79–0.85). Among owners, 74% had the device with them in the ED (95% CI 0.70–0.77); 62% of cell phone owners had text messaging (95% CI 0.58–0.66), 42% had internet access (95% CI 0.38–0.46), and 29% could download videos (95% CI 0.25–0.33). Of the subjects with incomes less than $20,000, 79% (95% CI 0.74–0.83) owned cell phones while 86% (95% CI 0.82–0.90) with incomes greater than $20,000 stated ownership.

**Conclusion:** Cell phones capable of receiving multimedia discharge instructions are prevalent among an ethnically diverse population of patients and visitors presenting to an urban public ED, despite this population’s limited economic means. Future work will investigate using cell phones as a means for delivering multimedia discharge instructions to those normally unable to understand them.

**630 Barriers to Accessing Prehospital Emergency Medical Services (EMS) Among Residents in a Developing Nation**

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**NYU/Bellevue Hospital, New York, NY**

**Background:** Emergency medical services (EMS) systems improve outcomes for a subset of patients in need of emergent care. Unfortunately, much of the world’s population does not have access to EMS. Uniting Global Medical Missions (UGM) in Libreville, Gabon, introduced its EMS system in 2002. In this qualitative study, we interviewed a convenience sample of patients and family members who presented to the emergency department (ED) at Jeanne Ebori Hospital, a public teaching facility in Libreville, Gabon, in October 2009.

**Objectives:**

To identify barriers to EMS access among Libreville residents.

**Methods:** In this qualitative study, we interviewed a convenience sample of patients and family members who presented to the emergency department (ED) at Jeanne Ebori Hospital, a public teaching facility in Libreville, Gabon, in October 2009.

**Results:** We achieved theoretical saturation at 27 subjects (22 patients and 5 family members). Two additional subjects were approached, but did not participate in the study; one refused participation, one did not speak French. Subjects recognize EMS may save lives. However, subjects rarely call EMS, because they are unaware of how to access it (e.g., lack the phone number), habitually use other transport modes, and have no means to pay. Subjects are frustrated by difficulty in contacting EMS and prolonged response times. Subjects also indicate that people often have no phone to call EMS, and that poor neighborhoods are hard to access due to lack of roads and safety concerns.

**Conclusion:**

Barriers to EMS access among Libreville residents have been identified. Future policy may be directed to establish means for payment, station vehicles throughout the city to decrease response times, and improve infrastructure to allow better vehicle access. Public outreach should be considered to improve community awareness of the EMS system. Future work will be undertaken to design and evaluate reform based on these results to improve access to EMS in Libreville.

**631 A Study of Emergency Department Characteristics and Capabilities in Beijing, China**

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1Peking Union Medical College, Beijing, China; 2Massachusetts General Hospital, Boston, MA

**Background:** Emergency departments (EDs) are a critical, yet heterogeneous, part of international emergency care.

**Objectives:**

We sought to assess features of EDs in Beijing, China. Such data may prove helpful for those seeking to further develop emergency medicine (EM) in Beijing.

**Methods:** Beijing EDs accessible to the general public 24/7 were invited to participate in the online national ED Inventories survey (www.emnet-nedi.org). Participants were asked about ED
The Livelihoods of Haitian Health Care Providers After the January 2010 Earthquake: A Pilot Study of Economic and Quality of Life Impact of Emergency Relief

Rohini J Haar, Sassan Naderi, John R. Acerra, Maxwell Mathias, and Kumar Alagappan
Northshore/LIJ Health System, Manhasset, NY

Background: Effective international response to disaster requires cooperation and coordination with existing infrastructure. However, aid often brings resources external to the affected countries that can compete with the country’s local work force. This study sought to evaluate the effect of the international humanitarian response to the 1/12/10 earthquake on Haitian health care providers (HHPs).

Objectives: To determine whether, among HHPs, workload or quality of life varied among different health sectors before and after the January 2010 earthquake.

Methods: We surveyed 59 HHPs in August 2010 using a modified World Health Organization Quality of Life-Brief questionnaire (WHOQol-B). The study population consisted of physicians, nurses, and technicians identified by visiting hospitals, NGO clinics, and private offices in Port-au-Prince. Respondents were categorized as public, private, or non-governmental providers.

Results: Providers at public hospitals and NGOs saw a substantial increase in workload (15/17 and 22/26 respondents, respectively). Conversely, 12/16 private providers saw a significant decrease in workload (p<0.0001). Although all groups were similar before the earthquake in the number of hours they reported working (total avg. 40hr/wk), they differed significantly after the earthquake. NGO and public providers averaged greater than 50 hrs/wk and private providers just over 33 hrs/wk of employment (p<0.001). HHPs working at NGOs and public hospitals had significantly lower scores on the WHOQol-B when answering questions about their environment (26.5 and 30.5 out of 100, respectively, vs. 36% CI 21–54%) considered it over capacity.

Conclusion: Almost all EDs in Beijing are hospital-based and contiguous, and therefore resemble most urban U.S. EDs in location and layout. However, Beijing EDs care for patients in a very densely populated area, as compared to even the largest U.S. cities. This unique environment is reflected in the high median visit volume, long length of stay, and frequent report of EDs over capacity. An improved understanding of this ED landscape will assist future efforts to further develop EM in Beijing.

Non-fatals Injuries Among Children Seeking Emergency Care in a Sub-Saharan African Emergency Department

Lauren Whiteside1, Rockefeller Oteng2, Patrick Carter1, John Amuasi2, Ekuw Amaban3, Michele Npapher3, and Rebecca Cunningham1
1University of Michigan, Ann Arbor, MI; 2Komfo Anokye Teaching Hospital, Kumasi, Ghana

Background: According to the World Health Organization, injuries represent the largest cause of death among people ages 1–40 and contribute to a large burden of disease worldwide.

Objectives: The aims of this study were: 1) to define the prevalence of injury among children seeking emergency care; 2) to characterize the relative mechanisms of injury responsible for the need for medical treatment; 3) to describe the demographic characteristics, and health status at time of presentation among children seeking care for injury to inform future injury prevention and acute trauma care research in Ghana and sub-Saharan Africa.

Methods: A prospective cross-sectional survey of pediatric patients (n=176) was conducted between July 13, 2009 in the Accident and Emergency (A&E) Center at Komfo Anoyke Teaching Hospital (KATH), which is a large teaching hospital in urban Kumasi, Ghana. Participants were asked questions regarding demographics, insurance status, overall health, and chief complaint.

Results: Of the 176 patients surveyed, 66% (n=116) presented for injury-related complaints. The mean age was 4.7 years (range 1.5 months to 17 years) and 68% (n=120) were male. Almost half or 43% (n=50) of injured patients had a road traffic injury (RTI). Of the RTIs, 58% (n=29) were from being an occupant in a car crash, 26% (n=13) were pedestrian injuries, and 14% (n=7) were from motorcycles. One third of participants (n=37) were injured from a fall and 68% of these patients were under five years old. There was no significant difference in demographics, self-reported health status, or indicators of socioeconomic status between injured and non-injured patients.

Conclusion: Among pediatric patients presenting for acute care at KATH, the majority of children (n=116, 66%) presented for injuries. To date, there are no studies that characterize pediatric patients who present for acute care in Ghana. Identifying injury patterns among non-fatal injuries and collecting this epidemiologic data is an important initial step to guide future research. Given that emergency medicine is in its infancy in Ghana, this baseline study underscores the importance of an emergency medicine curriculum which focuses on trauma and care of the acutely injured.

Patient Flow Analysis in a Ghanaiian Municipal Hospital

Cinnamon A Dixon1 and Damien Punguymiere2
1Cincinnati Children’s Hospital Medical Center, Cincinnati, OH; 2Kintampo Municipal Hospital, Kintampo, Ghana

Background: Efficient patient flow affects patient care and satisfaction. Patient flow analysis measures patient flow in health care settings, identifying constraints in flow and gaps in staffing/resources, and helping to minimize wait times and improve efficiency. This modality, used in developed countries, is not widely applied in developing countries, which often experience overcrowding and lack effective triage mechanisms and/or necessary staffing/resources.

Objectives: To determine average wait times for patients throughout their hospital journey (from arrival to disposition) and identify key constraints to patient flow in one Ghanaian municipal hospital.

Methods: This prospective study of patients presenting to Kintampo Municipal Hospital over a typical work week was piloted. Real-time data on arrival, waiting, and departure times at each stage of the patient’s hospital journey was tracked using a
635  A Survey of Emergency and Surgical Services in the United Republic of Tanzania

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¹Maimonides Medical Center, Brooklyn, NY; ²Beth Israel Deaconess Medical Center, Boston, MA; ³WHO Country Office, Dar es Salaam, Tanzania; ⁴Ministry of Health and Social Welfare, Dar es Salaam, Tanzania; ⁵World Health Organization, Geneva, Switzerland

Background: Delivering emergency and surgical care at first-referral facilities in developing countries is increasingly recognized as a cost-effective and achievable contributor to global public health. Quantification of a country’s capacity to provide these emergency services is vital to both plan initiatives for strengthening health systems and track their impact.

Objectives: Assess the capacity for delivery of emergency and surgical services in the United Republic of Tanzania.

Methods: The World Health Organization (WHO) Tool for Situational Analysis to Assess Emergency and Essential Surgical Care was used to survey 48 first-referral health facilities in the United Republic of Tanzania. Data from the surveys were uploaded and analyzed from the WHO DataCol database for Emergency and Essential Surgical Care.

Results: The 48 facilities surveyed served 18.6 million residents (46% of the population). Supplies for basic airway management were inconsistently available. Only 42% had consistent access to running water and electricity, and 23% of facilities had no radiographic capacity. While very basic interventions (suturing, wound cleaning) were noted in all facilities, more advanced life-saving procedures including chest tube thoracostomy (30/48), open fracture management (29/48), and laboratory testing and processing (0.85 hours ± 0.83 SD). Of the 6% (28/490) of patients subsequently dispositioned to the emergency department or hospitalized, wait times did not vary significantly. Staffing coverage was least in stations of high wait times during early morning hours, and increased after peak patient arrival surges.

Conclusion: Real-time assessment of patient flow at Kintampo Municipal Hospital revealed long wait times for registration, triage, and first provider contact which were consistent with scarcity of staffing and not variable on patient’s disposition. Results from this study have led to suggestions for improving flow in this hospital. Further, these methods could be used in other developing countries to assess patient flow and efficiency in their health care settings.

636  The Challenges of Providing Emergency Care in a Conflict Environment: A Survey of Iraqi Emergency Care Providers

Ross Donaldson¹ and Melinda Morton²

¹University of California - Los Angeles, Los Angeles, CA; ²Johns Hopkins School of Medicine, Baltimore, MD

Background: Iraq’s national health services have suffered significant deterioration due to violence. There has been little consideration of the needs of host nation physicians providing care in a conflict environment.

Objectives: This study provides an assessment of the needs and challenges of physicians working in Iraqi emergency departments (EDs), to assist health administrators in strengthening health care provision in Iraq.

Methods: This study is a convenience sample of physicians taking the International Medical Corps (IMC) Physician Course in Emergency Medicine in Baghdad from December 2008 to August 2009. The Iraqi Ministry of Health selected physicians involved in emergency medical care in Iraq to take this one-month course covering material inclusive of Advanced Cardiac Life Support (ACLS), Advanced Trauma Life Support (ATLS), and advanced airway instruction. Statistical analysis, including descriptive statistics and chi-square analysis, was performed with SPSS software.

Results: There were 147 survey respondents representing over 50 different hospitals from 11 provinces in Iraq. Respondents were primarily from Baghdad (72%), teaching hospitals (67%), and urban areas (94%). About half felt that the physicians in the ED were adequately trained (52% agreed/strongly agreed) and that consulting physicians were readily available (57%). However, only 25% of respondents felt that there were an adequate number of ED nurses, and 19% felt there were enough ED physicians. Twenty-five percent felt that the nurses were adequately trained. Overall, respondents felt safe in the hospital excluding the ED (46%); however, only 17% felt safe while in the ED. Specifically within the ED, 80% of respondents reported being assaulted by a patient or their family member at least once within the last year, and 38% had been threatened with a gun. Sixty percent of respondents knew a medical colleague at their hospital who had been injured by violence at work in the last year and 14% knew a colleague killed at work within the last year. The majority of respondents (61%) said that the security in the ED was inadequate.

Conclusion: Study findings demonstrate high levels of violent behavior directed toward doctors in Iraqi EDs, as well as staffing shortages and a lack of formal training in emergency care. These results provide information to help local governments and international actors support caregivers in Iraq.

637  The Management of Specialty Patients by Emergency Physicians in Beijing, China

Sanjay Gupta¹ and Joseph Walline²

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Objective: To determine the opinions of and experience with seeing specialty patients by emergency medicine (EM) in Beijing, China.

Methods: This was a prospective, cross-sectional survey of EM faculty and residents from community and university hospitals in Beijing, China. The timing was 10/2007. A convenience sample of 149 surveys with a return rate of 96% was used. The survey is 11 pages and addresses the education, opinions, medical practice, and demographics of subjects. Surveyed “specialty” patients included cardiology (card), critical care (crit), general surgery (gen), hematology (hema), internal medicine (med), obstetrics (obst), orthopedics (ortho), psychiatry (psy), urology (uro), and ENT (ENT). The survey used a five-point Likert scale model; (1) questions for frequency of exposure to these patients, (2) querying whether EM
doctors “can” see these patients. Analysis was performed with the chi-square test.

Results: The subject demographics: 43% female, 57% male; 80% EM trained, 20% non-EM trained; 74% have not been abroad, 26% have been abroad; 47% residents, 53% faculty. Of the surveyed EM doctors, 38% feel they cannot treat ob patients (pts), 34% gyn pts, 6% neuro pts, 12% ped pts, 13% ortho pts, 9% trauma pts, 50% psy pts, 16% urol pts, 39% oph pts, 11% derm pts, 53% dental pts, 33% ENT pts. Further, 75% do not treat or have never treated ob pts, 63% gyn pts, 29% neuro pts, 76% ped pts, 55% ortho pts, 51% trauma pts, 71% psy pts, 47% urol pts, 76% oph pts, 56% derm pts, 74% dental pts, 65% ENT pts. Gender differences in practice opinions are few. Male doctors feel more strongly that they can treat trauma pts (P=0.0016). In practice, male doctors are more likely to see gyn pts (P=0.0308), ortho pts (P=0.0066), trauma pts (P<0.0001), urol pts (P=0.0002), and derm pts (P=0.0251). No difference exists between EM and non-EM trained doctors in their opinions or in the patients they see in practice. Travel abroad confers no difference in doctors’ opinions or patients they see in practice. Residents feel that they can treat ob pts (P=0.0384), gyn pts (P=0.0146), ortho pts (P=0.0357), and urol pts (P=0.0398). In practice, no difference exists between residents and faculty in the type of patients that they treat.

Conclusions: Emergency medicine is a recently recognized specialty in China. Significant practice deficiencies exist in the EM management of specialty patients.

Background: Emergency departments (EDs) are the basic unit of international emergency medicine (EM), but often differ in fundamental features, especially in developing countries.

Objectives: We sought to assess the current state of EDs in Abuja, Nigeria. Methods: Facilities with EDs open 24/7 to the general public were contacted and surveyed using the National ED Inventories survey instrument (www.emnet-nedi.org). ED staff were asked about ED characteristics with reference to calendar year 2008. Data were analyzed using descriptive statistics, including 95% confidence intervals (CI).

Results: Twenty-four EDs participated (83% response). One hundred percent were located in hospitals, ranging in size from 6 to 250 beds. Seventy-five percent were independent hospital departments; the rest belonged to general medicine or surgery departments. Nine-two percent (CI 73-99%) had a contiguous layout (with medical and surgical care provided in one area). Consultant availability to EDs ranged from low (e.g., neurosurgeons - available 24/7 to 4% of EDs) to high (e.g., general surgeons - available 24/7 to 87% of EDs). All EDs saw adults and children, with a median of 1,500 annual visits (interquartile range 648-2,328). Patient length of stay varied: 36% of EDs (CI 19-59%) reported patients typically stayed less than 1 hour; 38% (CI 19-59%) reported patients stayed 1 to 6 hours; and 25% (CI 10-47%) reported patients stayed over 6 hours. Almost half of respondents (46%; CI 26-67%) thought their ED operated under capacity, while the rest (53%; CI 33-74%) thought their ED operated at a good balance or at capacity.

Conclusion: As its capital city, Abuja is at the forefront of EM development in Nigeria. Although ED location and layout in Abuja do not differ greatly from that in a typical U.S. city, ED utilization did differ, with a particular emphasis on some emergent needs (such as major trauma). Consequently, most EDs had low median visit volume, and all EDs operated at or below capacity. These data may assist those seeking to further develop EM in Abuja.

A Profile of Emergency Departments in Abuja, Nigeria

John I Oshiomogho1, George I Ewuwa2, Anne P Steptoe1, Ashley F Sullivan1, and Carlos A Camargo Jr1

1Massachusetts General Hospital, Boston, MA; 2Family Health International, Abuja, Nigeria

Background: Rwanda is a landlocked East African country that was the site of the 1994 genocide, during which much of its health infrastructure was destroyed. It remains one of the poorest and least developed countries in the world. In the last 15 years, there have been significant efforts to rebuild its health care system. No study has since examined Rwanda’s emergency medicine (EM) infrastructure.

Objectives: To perform an initial descriptive study of EM infrastructure in post-conflict Rwanda.

Methods: We employed two methods to examine EM infrastructure. The first was 160 hours of direct observation at six health care sites in the capital city of Kigali (two national referral centers, two public community centers, and two private NGO clinics) leading to a descriptive understanding of Rwanda’s EM infrastructure. The second method used face-to-face narrative interviews based on a five-item open-ended questionnaire with a convenience sample of 54 health care workers at these facilities. Both methods were carried out solely by the first author, an EM resident and epidemiologist trained in health infrastructure surveying with fluency in two of Rwanda’s three national languages.

Results: A relatively basic EM infrastructure was found to exist. Emergency care is available to all, though timely access and demand for payment are barriers to care. Emergency care is delivered at all levels, from local community health centers to district hospitals to national referral centers. The majority of physicians working in the emergency departments are non-EM trained, and only one hospital provides specialized training at the BLS level to EM practitioners. Prehospital care is almost entirely missing, with no national emergency reporting system, systematic use of ambulances, or prehospital triage. The most commonly cited problems facing EM infrastructure in Rwanda were lack of resources (94% of respondents), need for specialized EM training (89%), and absence of prehospital care (74%). All except one worker surveyed (98%) were satisfied with the progress Rwanda has made to improve EM infrastructure in the last 10 years.

Conclusion: Despite ongoing challenges, the infrastructure for the delivery of emergency care is much improved since 1994, and Rwanda’s continuing progress can serve as a model for EM development in other developing and/or post-conflict countries.

Prehospital Care in Ghana: Utilization of the National Ambulance Service

Kim-Tan Nguyen

Maimonides Medical Center, Brooklyn, NY

Background: The National Ambulance Service (NAS) was established in 2004 to address medical emergencies and to reduce morbidity and mortality of critically ill and injured patients by providing care on site and en route to health care facilities. Injury has become a leading health problem in Ghana, with road traffic accidents increasing daily.

Objectives: This study examined the impact of NAS on access to critical care of injured patients in a representative sample of health care centers in Ghana.

Methods: Ambulance records from 10 regions of Ghana were reviewed for chief complaints and overall number of cases. In addition, ambulance records from three regions of Ghana (Apam, Mampong, and Accra) were retrospectively reviewed and analyzed in detail for case response time and time spent on scene. Interviews with patients, health care staff, and administrators were conducted in these three regions to evaluate the impact and challenges faced by the ambulance service.

Existing Infrastructure for the Delivery of Emergency Care in Post-conflict Rwanda: An Initial Descriptive Study

Leana S Wen1 and Douglas Char2

1Harvard Affiliated Emergency Medicine Residency, Brigham & Women’s Hospital/ Massachusetts General Hospital, Boston, MA; 2Washington University School of Medicine, St. Louis, MO

Background: Rwanda is a landlocked East African country that was the site of the 1994 genocide, during which much of its health infrastructure was destroyed. It remains one of the poorest and least developed countries in the world. In the last 15 years, there have been significant efforts to rebuild its health care system. No study has since examined Rwanda’s emergency medicine (EM) infrastructure.

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Factors Associated With Inpatient Mortality in a Field Hospital Following the Haiti Earthquake, January–May 2010

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1Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Injury Response, Atlanta, GA; 2University of Miami Miller School of Medicine, Department of Neurosurgery, Miami, FL; 3Centers for Disease Control and Prevention, National Center of Emerging and Infectious Diseases, Division of Global Migration, Atlanta, GA; 4University of Miami Miller School of Medicine, Department of Surgery, Miami, FL; 5University of Miami Miller School of Medicine, Department of Pathology, Miami, FL; 6University of Southern California Keck School of Medicine, Department of Surgery, Los Angeles, CA

Background: Few studies have examined patient outcomes in field hospitals over a sustained post-earthquake response.

Objectives: This study describes factors associated with inpatient mortality in the University of Miami Global Institute/Project Medishare (UMGI/PM) field hospital, which provided medical care in response to the 2010 Haiti earthquake.

Methods: The following variables were abstracted retrospectively from medical charts of patients admitted to the UMGI/PM hospital from January 21-May 28, 2010: age, sex, length of stay, admission ward, diagnoses, injury mechanism, and surgical procedure. Cases (patients who died) and controls (survivors) were compared. In addition to descriptive analysis, three multivariate logistic regression models were used to determine predictors of death in the following groups: all patients, injured patients, and patients with only non-injury diagnoses.

Results: During the study period, 1339 patients were admitted to the hospital, of whom 100 (7.5%) died. Among all patients, adult intensive care unit (ICU) admission (adjusted odds ratio (AOR) = 7.6, 95% confidence interval (CI) = 3.4–16.8), neonatal ICU/pediatric ICU admission (NICU/PICU) (AOR = 7.8, 95% CI = 2.7–22.9), and cardiac/respiratory diagnosis (AOR = 8.5, 95% CI = 4.9–14.8) were significantly associated with death. Among injured patients, adult ICU admission (AOR = 7.4, 95% CI = 1.7–33.3) and penetrating injury (AOR = 3.3, 95% CI = 1.004–11.1) were significantly associated with death. Among patients with only non-injury diagnoses, adult ICU admission (AOR = 6.6, 95% CI = 2.7–16.4), NICU/PICU admission (AOR = 8.2, 95% CI = 2.1–31.8), and cardiac/respiratory diagnoses (AOR = 6.5, 95% CI = 3.6–12.0) were significantly associated with death.

Conclusion: Given continued vulnerability of urban centers in developing countries to natural disasters, enhanced preparation for long-term field hospital response should include a surge of injuries, as well as chronic disease exacerbations and infectious diseases.

Measurement of CSF Opening Pressure During Lumbar Puncture in the Sitting Position in the Emergency Department

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Background: Traditionally lumbar puncture (LP) is performed in the lateral decubitus position. For mechanical reasons, practicing physicians may elect to perform the procedure with the patient in a sitting position. There are no data describing the normal range of cerebrospinal fluid (CSF) opening pressures (OP) in patients in the sitting position.

Objectives: We sought to identify a range of normal CSF OP in the sitting-up, feet supported position (SUFS), and to determine whether head height above the needle affects the variance of the obtained pressures.

Methods: IRB-approved, prospective study of patients undergoing LP in two urban emergency departments (EDs). Exclusion criteria were <18 years old, positive CSF findings, contraindication to LP, known hydrocephalus, structural intracranial abnormality, or ventricular shunt. Physicians performed LP in either the lateral decubitus (LD) or SUFS position, as per clinical judgment. CSF OP was measured in all patients. In SUFS patient, head height above needle hub (measured vertically to the level of the external auditory meatus) was obtained.

Results: Forty-two patients were included in the study (20 SUFS and 22 LD). There was no difference in age, height, or discharge rate in either group. There were more women in the LD groups (63% vs. 50%). The average OP was 14.8 cm higher in the SUFS position (19.8 cm LD vs 34.6 cm SUFS; p<0.001). Standard deviations (SD) of OP pressures were similar (5.7 LD vs 5.9 SUFS) in the two groups. Average head height (HH) above the needle hub (SUFS only) was 28.5 cm (SD 7.9), and no correlation between HH and OP was found (R2 = 0.06)

Conclusion: In the general ED population, opening pressure on patients in the SUFS position is significantly higher than opening pressure in the LD position, with a similar distribution. Variations in opening pressure cannot be explained by variations in HH above the needle hub. An alternative measure to determine the effects of the CSF column height on SUFS pressures should be sought.
Background: Historically the “standard of care” for diagnosis of subarachnoid hemorrhage (SAH) has been computed tomography of the head (CTH) followed by lumbar puncture (LP). The sensitivity of CTH is variable depending on size of hemorrhage and duration from onset. These limitations obligate further diagnostic testing to role out the SAH in “high risk” patients.

Objectives: To determine the incidence of LP diagnosed SAH in patients presenting to the emergency department (ED).

Methods: Design: retrospective cohort study. Participants: all patients presenting to the ED between Jan 2005 and December 2009 in 20 NJ/NY hospitals. ICD-9 diagnosis of headache, tension headache, cluster headache, migraine headache, and SAH using a computerized tracking system. The CPT code for LP was then cross-referenced to final diagnosis. A manual chart review was conducted on all patients diagnosed with SAH who had LP performed. Patients were excluded if an alternative diagnosis was determined or chart unavailability.

Statistics: Mann-Whitney Test and two-tailed Fischer’s exact test with a preset alpha of 0.05.

Results: A total of 3,741,129 patients were evaluated during the study period. A primary or secondary diagnosis of headache was made in 167,066 patients, of whom 2433 (1.5%) underwent LP. SAH was diagnosed in 1508 patients. Of SAH patients, 30 (2%) had a procedure code for LP. Charts were available for 26 (87%) patients. Four were ultimately determined not to have a SAH, leaving 1.2% (n = 18/1500) (95% CI = 0.7%–1.9%) of patients with negative CTH and positive LP. Regarding these patients, the initial CTH was performed within 24 hrs from onset in 54% (n = 10). Female sex comprised 900/1508 (60%) of all SAH patients, compared to 74% (n = 22/30) of those diagnosed with LP (p = 0.17). Median age for those diagnosed with LP after negative CT was 46 (SD +/- 12), compared with an overall age of 58 yrs (SD = +/−19.2) (p <0.001). ED deaths occurred in 7 patients overall, none in the LP group.

Conclusion: Only a small percentage of our patients were diagnosed with SAH utilizing an LP, and this occurred more frequently in younger patients.

**643 Incidence of Lumbar Puncture Diagnosed Subarachnoid Hemorrhage in the Emergency Department**

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1Morristown Memorial Hospital, Morristown, NJ; 2UMDNJ- Robert Wood Johnson Medical School, New Brunswick, NJ

**Results:**

- Proportion Returning Within 72 Hours Following Index Visit for Headache

<table>
<thead>
<tr>
<th>Stratum</th>
<th>No Lumbar Puncture</th>
<th>Lumbar Puncture (LP)</th>
<th>Difference</th>
<th>95% Confidence Interval</th>
<th>Relative Risk (LP versus NO LP)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female &lt; 36 years</td>
<td>6.2%</td>
<td>15.6%</td>
<td>9.3%</td>
<td>4.4–14.3%</td>
<td>2.5</td>
<td>1.8–3.5</td>
</tr>
<tr>
<td>Female &gt;= 36 years</td>
<td>4.5%</td>
<td>8.8%</td>
<td>3.5%</td>
<td>0–7%</td>
<td>1.8</td>
<td>1.1–2.9</td>
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<tr>
<td>Male &lt; 36 years</td>
<td>4.9%</td>
<td>10.2%</td>
<td>5.3%</td>
<td>-0.1–11.5%</td>
<td>2</td>
<td>1.1–4</td>
</tr>
<tr>
<td>Male &gt;= 36 years</td>
<td>4.4%</td>
<td>3.7%</td>
<td>0.7%</td>
<td>-4.5–3.2%</td>
<td>0.85</td>
<td>0.3–2.3</td>
</tr>
</tbody>
</table>

**Background:**

- **Impact of Lumbar Puncture on Return Visits Among Emergency Department Patients Presenting With Cephalgia: A Retrospective Cohort Study**

Jared Bayless, Barbara Smith, Jon Lemus, John Kahler, and William J Meurer
University of Michigan, Ann Arbor, MI

**Methods:** This study was performed at a suburban, university-based ED with over 60,000 adult visits annually. Patients were included if they were at least 18 years old and presented to the ED with headache. Case ascertainment occurred using the ED electronic information system and billing data. Visits from January 2006 through June 2009 were included. Relative risks (RRs) for return to the ED within three days were calculated comparing patients with and without LP. Separate stratified estimates were performed by sex and by age (>36 versus younger). Proportion revisiting with and without LP during index visit within each sex/age stratum were estimated. Ninety-five percent confidence intervals are provided in parentheses.

**Results:** A total of 8370 visits for headache (LP performed 9.4%, median age 36; 60% female) were identified during the study period. Of these, 441 (5.3%) were revisits within three days of a prior visit for headache, of which 13 resulted in admission. The RR for three day revisit associated with LP was 2 (1.6–2.6) for all patients; stratified by sex the RR for females was 2.2 (1.4–3.2) and for males was 1.5 (0.9 - 2.5). The RR for patients younger than 36 years was 2.4 (1.8–3.2) and for older patients it was 1.6 (1.1–2.4). The proportions of patients with a revisit within three days within each age group by sex are given in the Table.

**Conclusion:** We found that return visits after ED encounters for headache were common, and approximately doubled if an LP was performed. Revisits after LP were most common in younger patients, particularly females. Further study of the relationship between age, sex, and post-LP headache is warranted.

**645 Computed Tomography or Magnetic Resonance Angiography in Suspected Subarachnoid Hemorrhage: Is It Safe to Forego Lumbar Puncture?**

Lisa E Thomas1, Amanda D Czuczzman1, Alyson B Boulanger2, David FM Brown2, and Keith A Marini2

1Brigham and Women’s Hospital/Massachusetts General Hospital, Boston, MA; 2Massachusetts General Hospital, Boston, MA

**Background:** In emergency department (ED) patients with acute headache (HA), when the cerebrospinal fluid (CSF) contains red blood cells (RBCs), it is difficult to distinguish a traumatic tap from...
true bleeding due to subarachnoid hemorrhage (SAH). In these cases, computed tomography (CT) or magnetic resonance (MR) angiography may be obtained to evaluate for a possible source.

**Objectives:** To determine whether patients with RBCs in their CSF but negative cerebrovascular imaging suffer subsequent intracranial hemorrhage (ICH) during long-term clinical follow-up.

**Methods:** An IRB-approved retrospective cohort study was performed at an urban hospital with 90K annual ED visits. Records of 4496 consecutive ED patients >16 years old billed for a lumbar puncture (LP) between 2001–2009 were reviewed. Inclusion criteria included complaint of HA> 5 RBCs measured, and cerebrovascular imaging (CT or MR angiography) within two weeks of the ED visit. Two unblinded reviewers abstracted by consensus the full medical records of 278 patients. Exclusion criteria included ED fever >100.5 deg F, aneurysm or vascular lesion on imaging, culture-positive meningitis, or less than six months of clinical follow-up. Planned reliability analysis is pending. Follow-up included review of health records or phone interview. The primary outcome was subsequent nontraumatic ICH. Summarize statistics were computed with SPSS and exact confidence intervals with Statxact3.

**Results:** One hundred and fifty-eight patients were included with a mean age of 44.2 (SD 13.7) years. Ninety-eight (62%) were female. Over a median follow-up of 40 months (IQR 21.8–68), 0/158 patients (0%, 95% CI 0–2.3) had a subsequent ICH. 11/158 patients (7%, 95% CI 3.5–12.1) had an LP-related complication including HA or neck, back, or leg pain, and 0/158 patients (0%, 95% CI 0–2.3) had an angiography-related complication such as allergic reaction or contrast nephropathy.

**Conclusion:** Patients who present to the ED with acute HA concerning for SAH and have a bloody LP but negative cerebrovascular imaging are at low-risk for subsequent hemorrhagic events. Cerebrovascular imaging alone may be an acceptable approach to rule out suspected aneurysmal SAH at risk for subsequent bleeding.

**References:**

1. CHU Sainte-Justine, Montreal, QC, Canada;
2. Hôpital Sacré-Coeur, Montreal, QC, Canada

**Background:** Assessment of pain is multidimensional. Fear and anxiety may bias pain reporting and interfere with measuring pain.

**Objectives:** The objective of our study was to determine discriminate validity of the Wong Baker FACES Pain Rating Scale (WBPS) using the Child Medical Fear Scale (CMFS). We hypothesized that children (6–12 yrs) would be able to discriminate between fear and pain measurements. Discriminate validity would be satisfied by a poor correlation between the scales.

**Methods:** Study Design: prospective observational. Setting: university-based, suburban pediatric emergency department (ED). Subjects: pediatric patients, between the ages of 6 and 12 years, presenting with acute pain. Measurers: patients rated their pain severity on the six-item WBPS ordinal scale. Patients also completed a 26-item Likert questionnaire assessing fears in medical settings: the Child Medical Fear Scale (CMFS), minimum score 26, maximum 78. Analysis: correlation between the WBPS and the CMFS total score and subscale (procedural, environmental, intrapersonal, and interpersonal fears) scores were assessed with Spearman’s correlation.

**Results:** One hundred and fifty-eight children were approached. Complete pain and fear scale data were available in 135; 48% female, 73% Caucasian. Seventy percent of cases resulted from trauma/injury. The most common pain locations were upper extremity (32%), lower extremity (25%), head/scalp (17%). There was a normal distribution of scores on the WBPS. The median CMFS was 40 (IQR 34–46). Correlation between total CMFS and the WBPS pain scale was poor; r = –0.03 (95% CI –0.2 to 0.14). Correlation between the CMFS subscales and the WBPS were also poor. Correlation among the CMFS total score and WBPS did not differ by sex, grade, pain location, or cause of pain (traumatic vs. atraumatic).

**Conclusion:** The WBPS is not mistaken for fear among 6–12 year old patients presenting to the ED with pain. The WBPS demonstrated discriminate validity for assessing pain in our population of children.
649 Adequacy of Pain Management in Children Discharged From the Emergency Department After Treatment for Long-bone Fractures
Rachel W Thompson, Baruch Krauss, Young-Jo Kim, and Lois K Lee
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Background: Pediatric orthopedic injuries are a common painful presenting complaint in the emergency department (ED); however, little is known about the duration and severity of pain after discharge or whether there is increased post-procedural pain associated with closed reduction. As a result, considerable variation exists in prescribing practices for pain control after discharge.

Objectives: We sought to determine the prevalence of significant post-discharge pain and to compare pain severity between fractures requiring simple casting to those treated with sedated reduction and casting to help guide discharge pain management.

Methods: This is a prospective observational study of healthy children 4 to ≤17 years with isolated upper or lower extremity long-bone fractures undergoing ED casting (+/- sedated reduction) from June to September 2010. Fractures requiring operative reduction were excluded. Injury history and physical exam findings were collected via a standardized questionnaire completed by the ED physician. Discharge analgesic prescriptions were provided at the ED physician’s discretion. The medical record was reviewed for the ED course data. The Parents’ Postoperative Pain Measure (PPPM), which scores pain on a scale of 0–15 based on yes/no questions, was administered at the ED physician’s discretion. The medical record was reviewed to assess PPPM scores for and without reduction and cast. Discharge analgesics were prescribed at the ED physician’s discretion. The medical record was reviewed to assess discharge analgesics.

Results: One hundred and fifty-eight children were enrolled; 15 were unable to complete the VAS, one child was unable to complete the CPPP. Of the 142 children with completed pain scales, 46% were female, 7% were Caucasian. Sixty-eight percent of cases resulted from trauma. The most common pain locations were upper extremity (32%), lower extremity (24%), and head/scalp (19%). The median duration of pain was 6 hours (IQR 3–46). The mean VAS increased across WBS and CPPP categories; both p < 0.001. ANOVA demonstrated significant differences in mean VAS across WBS and CPPP categories; both p < 0.001. Agreement (κ) between pain scales was moderate: WBS/VAS = 0.52 (95% CI: 0.39 to 0.63), CPPP/VAS = 0.49 (95% CI: 0.35 to 0.61), and CPPP/WBS = 0.51 (95% CI: 0.38 to 0.62). Correlation among the pain scales did not differ by sex, pain location, or cause of pain. Agreement between the WBS and VAS was stronger for patients in upper middle school (grades 6 and 7); r = 0.83 (95% CI 0.68 to 0.91) and 0.69 (95% CI: 0.39 to 0.86), respectively.

Conclusion: The correlation between the three pain scales was fair to moderate for children ages 6–12, though slightly better in the older children. This suggests that these scales are not interchangeable, making comparison across studies using different scales difficult.

650 Barriers to Pap Smear Testing as Preventive Health Measure Among Adult Patients Presenting to the Emergency Department
Nidhi Garg and Sanjey Gupta
New York Hospital Queens, Flushing, NY

Background: Health promotion and disease prevention are increasingly recognized activities that fall within the scope of emergency medicine. The purpose of this study was to identify barriers for Pap smear testing in adult patients presenting to the emergency department (ED).

Objectives: To identify barriers in Pap smear testing in adult patients presenting to an ED that services a large immigrant and non-English speaking population.

Methods: A prospective, cross-sectional, survey based study was conducted at an urban Level I trauma center with annual ED visits of 120,000/year. Trained research assistants interviewed a convenience sample of patients over 36 months with a three-page survey recording demographics, knowledge, and obtaining Pap smear testing, and other current female preventive health recommendations from the Agency for Healthcare Research and Quality. Chi-square tests were used for categorical data as appropriate. Logistic regression was performed for the significant factors.

Results: A total of 1848 females were interviewed over the study period with a median age of 59 yrs (IQR 41–77), 722 (39%) immigrants with median time since immigration of 20 yrs (IQR 10–35), and 1696 (91.6%) insured. Overall, 1394 (75.3%) had knowledge of obtaining Pap smears and 184 (9.9%) did not answer the question. Total 1131 (61.1%) had a Pap smear in the past and 187 (10%) did not answer the question. There was a significant difference in having the knowledge to obtain a Pap smear and actually receiving testing among immigrants and non-immigrants on chi-square test, with p-values of <0.001 and 0.02, respectively. Logistic regression with Pap testing as outcome and adjusted with Pap knowledge, age, immigration, and insurance status showed that it was associated with Pap knowledge with OR 23 (CI 16–35), p<0.001 and was not associated with immigration status.

Conclusion: Immigrants, despite cultural norms and practices that they bring with them, seem to be willing to conform to standard American health care practices once they are educated about them.

651 Barriers to Timely Primary Care and Emergency Department Utilization: Implications for Health Care Reform
Paul T Cheung, Jennifer L Wiler, and Adit A Ginde
University of Colorado School of Medicine, Aurora, CO

Background: Patients are having increased difficulty in accessing primary care, and health care reform is expected to exacerbate this problem. Decreased primary care access may result in increased emergency department (ED) utilization.

Objectives: To measure the prevalence and temporal trends in barriers to timely primary care and to determine the association between these barriers and ED utilization.

Methods: We analyzed 317,497 adult participants of the 1999–2009 National Health Interview Survey (NHIS), an annual, nationally representative sample. Five specific barriers to timely primary care and the frequency of ED visits during the past 12 months were measured by self-report. We analyzed the survey-weighted
Background: The Agency for Healthcare Research and Quality (AHRQ) defines ambulatory care sensitive conditions (ACSC) as hospitalizations that are preventable with timely and effective primary care. Five million adult admissions to U.S. hospitals involve primary care physician [PCP] that outlines how to obtain medical care and how to access care. 

**Results:** Overall, 9.7% of adults per year had ≥1 barrier to timely primary care and 20.1% had ≥1 ED visit. Adults with a higher number of barriers were more likely to have ≥1 ED visit (18.8% for 0 barriers, 29.5% for 1 barrier, and 36.5% for ≥2 barriers). After adjusting for covariates, the following barriers were each independently associated with ≥1 ED visit: “couldn’t get through on phone” (adjusted odds ratio [OR] 1.63; 95% CI, 1.52–1.74); “couldn’t get an appointment soon enough” (adjusted OR 1.53; 95% CI, 1.46–1.61); “waiting too long in doctor’s office” (adjusted OR 1.45; 95% CI, 1.38–1.52); “clinic not open when you could go” (adjusted OR 1.65; 95% CI, 1.55–1.75), and “not having transportation” (adjusted OR 1.83; 95% CI, 1.70–1.96). The prevalence of having ≥1 barrier increased from 6.5% (95% CI, 6.0–6.6) in 1999 to 12.5% (95% CI, 11.9–13.1) in 2009. Concurrently, the prevalence of having ≥1 ED visit increased from 17.2% (95% CI, 16.6–17.7) to 21.2% (95% CI, 20.6–21.9). Among adults with ≥1 ED visit, the prevalence of having ≥1 barrier to timely primary care increased from 12.0% (95% CI, 11.0–13.0) to 18.9% (95% CI, 17.6–20.3).

**Conclusion:** Barriers to timely primary care were associated with increased ED utilization. Over the past decade, multiple barriers to timely primary care have increased and were more prevalent among those with ED visits. These trends merit further investigation and may necessitate intervention as health care reform is implemented.

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**Financial Impact of Primary Care Preventable Admissions Through the Emergency Department**

Joseph A. Tyndall, Abhijit R Kanthala, Doug Dame, and Donna L. Carden

University of Florida, Gainesville, FL

**Background:** The Agency for Healthcare Research and Quality (AHRQ) defines ambulatory care sensitive conditions (ACSC) as hospitalizations that are preventable with timely and effective primary care. Five million adult admissions to U.S. hospitals involve treatment for one or more of the 14 ACSCs at a cost of over $26.5 billion. The financial impact of these preventable admissions that occur through the emergency department (ED) is unexplored.

**Objectives:** The purpose of this study was to define the financial impact of patients admitted through the ED with an AHRQ-defined primary care preventable condition (ACSC).

**Methods:** Adult ED admissions between January 1, 2006, and August 1, 2010 from an academic health center were analyzed. Total ED costs, patient charges, hospital reimbursement, and ED and hospital costs, patient charges, and hospital reimbursement were used to choose patients and day-time blocks. Patients deemed ineligible were those too ill medically, surgically, or psychiatrically to complete the survey. Appropriate parametric and nonparametric tests were used for univariate analysis and those variables achieving statistical significance (p < 0.10) were tested in a multivariable logistic regression (MVLR) model. Power calculations indicated that to limit the width of the 95% CIs within 3%, 1000 pts needed to complete surveys.

**Results:** 1500 patients were approached and 1083 (72%) agreed to participate. Of this study population (n=1083), the mean age was 34 (SD=22), 51% were female, and 32% (30%) were admitted. By self-report, 430 (40%; 95% CI 37–43%) of patients attempted to reach their PCP and 356 (83%, 95% CI 79–86%) were successful. Among these 356 patients, 74% (95% CI 69–79%) were referred to the ED. The most common reason patients gave for coming to the ED was their belief that their problem was serious (61%), followed by being referred in (31%). In a MVLR, the odds of patients referred by a PCP were 1.89 (95% CI 1.36–2.60) times more likely to be admitted than patients who self-referred. Older age also predicted admission, but sex did not.

**Conclusion:** In one urban setting. ED patients state that the most common reason for seeking care there is the belief that their problem is serious. In addition, a sizable minority of patients successfully reaches their primary care physician and is referred in. These patients are more likely to be admitted than self-referred patients. A survey of PCPs identifying the reasons they choose to refer patients to the ED could represent important additional information on ways to help prevent ED overcrowding.

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**Primary Care Provider Referrals and Patients’ Self-reported Reasons for Seeking ED Care**

Svetlana Lobachova, Julia Sinclair, David Brown, Yuchiao Chang, and John T. Nagurney

*Harvard Medical School, Boston, MA; Massachusetts General Hospital, Boston, MA*

**Background:** In 2007 there were 117 million visits to U.S. emergency departments (EDs), many of which reported overcrowding as an important issue. Estimates suggest that 20–60% of these visits are for non-urgent problems. Little is known about why patients choose EDs to receive their care.

**Objectives:** We hypothesized that only a minority of ED patients would have been referred by primary care providers (PCPs), but that they would be sicker with a higher admission rate.

**Methods:** We conducted a cross-sectional survey of patients presenting to the 90,000 annual visit ED of an urban academic medical center in the summer of 2009. Questionnaires were administered verbally by trained research assistants. To address selection bias, standard statistical sampling techniques were used to choose patients and day-time blocks. Patients deemed ineligible were those too ill medically, surgically, or psychiatrically to complete the survey. Appropriate parametric and nonparametric tests were used for univariate analysis and those variables achieving statistical significance (p<0.10) were tested in a multivariable logistic regression (MVLR) model. Power calculations indicated that to limit the width of the 95% CIs within 3%, 1000 pts needed to complete surveys.

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**Conclusion:** In one urban setting. ED patients state that the most common reason for seeking care there is the belief that their problem is serious. In addition, a sizable minority of patients successfully reaches their primary care physician and is referred in. These patients are more likely to be admitted than self-referred patients. A survey of PCPs identifying the reasons they choose to refer patients to the ED could represent important additional information on ways to help prevent ED overcrowding.

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**An Intervention for Reducing Nonurgent Pediatric Emergency Department Utilization**

Jesse J Sturm, Harold K Simon, and Daniel A Hirsh

Emory University, Atlanta, GA

**Background:** Use of the pediatric emergency department (PED) for non-urgent concerns is undesirable because of the uncoordinated care received. These visits are missed opportunities to provide essential preventative care.

**Objectives:** To determine if an information sheet and brief teaching session administered in the ED (specific for that patient’s primary care physician [PCP]) that outlines how to obtain medical advice after hours and same day appointments has an effect on non-urgent ED PED follow-up visits.

**Methods:** This randomized, controlled trial enrolled patients 3 months –18 years who were seen in the PED for non-urgent concerns. Only patients who identified a PCP within a network of
33 practices were eligible. All subjects were given standard discharge instructions. Intervention subjects (a) received a laminated handout specific to their PCP which was individually developed with the PCP that outlined practice location/hours, ways to obtain advice after hours and same day appointments, and the scope of the practice (i.e., laceration and simple fracture care), and (b) had a 10 min session with a researcher discussing the form. The control group receive neither (a) nor (b). The primary outcome was follow-up PED visitation for non-urgent concerns (defined as lowest 2 Emergency Services Index [ESI] levels) during a 12 month follow-up period.

**Results:** A total of 332 subjects were randomly assigned, and baseline measures were similar between the intervention and control groups (age, race, sex, insurance type). At 12 months follow-up, 72/164 (44%) patients in the intervention group returned to the PED for low-acuity concerns (ESI level 4 or 5) compared to 89/168 (53%) in the control group (p=0.061). When 16 enrolled patients who were high-utilizers of the PED prior to study enrollment (defined as > 10 prior visits) were removed from the analysis, 64/153 (42%) patients in the intervention group returned to the PED for low-acuity concerns compared to 87/162 (54%) control patients (p=0.023). At higher-acuity levels, the rates of PED utilization between the groups were similar.

**Conclusion:** A simple teaching intervention administered in the PED specifically designed in cooperation with the patients’ PCP is effective in reducing low-acuity visits to the PED over a 12 month follow-up period. Patients with pre-existing patterns of non-acute PED utilization were somewhat resistant to the intervention. The intervention had no effect on follow-up PED utilization in higher-acuity visits.

**The Effect of Health Literacy on Patient Reason for ED Use**

Abhijit R. Kanthala1, Daniel L. Bennett1, Connie L. Arnold2, Terry C. Davis2, Allyson G. Hall1, and Donna L Carden1

1University of Florida, Gainesville, FL; 2Louisiana State University Health Sciences Center, Shreveport, LA

**Background:** Health literacy (HL) is the degree to which individuals can obtain, process, and understand the basic health information needed to make appropriate health decisions. Evidence suggests that those with low HL have more emergency department (ED) visits than those with higher HL. There is no research linking patient HL with reason for ED use.