NERDS19 Abstracts
Background
Falls are the leading cause of injury-related mortality and ED visits in older adults. However, there is a lack of in-ED fall prevention programs. Our objective was to qualitatively examine participant and caregiver experiences with a novel in-ED/follow-up fall prevention protocol.

Methods
This qualitative program evaluation of a pilot randomized control trial, GAPcare: The Geriatric Acute and Post-acute Fall Prevention Intervention, enrolled patients and caregivers who presented to two academic EDs after a fall. We conducted, recorded, and transcribed verbatim semi-structured interviews of participants who received the intervention (in-ED physical therapy (PT) and pharmacy consults and enhanced care coordination) and their caregivers. An initial coding scheme was developed and refined. Multiple investigators independently coded and analyzed transcripts in an iterative process. Data collection and qualitative analysis followed a descriptive approach and continued until thematic saturation was achieved identifying themes and sub-themes of perceptions of ED care and care coordination.

Results
We conducted 16 interviews with patients (n=10; mean age 83, range 67-96; gender 11 F, 5 M) and caregivers (n=6; gender 5 F, 1 M). Qualitative analysis identified the following themes:

Seniors are often overwhelmed with the volume of information presented to them in the ED, and those with caregivers present in the ED appear to recall and implement suggestions to reduce falls more readily. This suggests that future intervention designs should incorporate caregivers and would benefit from frequent instructional boosters. ED referrals to outpatient PT may not be as readily accepted in seniors who fall due to physical limitations, care coordination difficulties, financial constraints, or negative perceptions of prior PT experiences. Seniors favor behavioral interventions that target ‘life improvement’ and promote independence and autonomy rather than ‘risk reduction’.

Conclusion
Qualitative findings suggest that ED-initiated behavioral interventions to reduce falls among seniors should target life improvement and include caregivers. Interventions that include referral to outpatient PT should address perceived barriers including cost, difficulties with care coordination, and perceived lack of utility.

Keywords
falls; pharmacy; physical therapy; emergency department; caregiver
2017 Benchmarking Survey: Comparing Pediatric vs. Adult Academic Emergency Departments

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Background: The Academy of Administrators in Academic Emergency Medicine (AAAEM) Benchmarking Survey of academic emergency departments (EDs) in the U.S. was conducted in 2017. Based on survey data, we compared measures of operational performance between Pediatric and Adult (defined as fewer than 5% pediatric visits) EDs.

Methods: We compared measures of 1) Patient volumes, length-of-stay (LOS) and acuity and 2) Faculty staffing, productivity and percent effort in academics and administration. T-tests were employed to compare differences in continuous measures and inferences for categorical variables were made using Pearson’s Chi-square test. All p-values were adjusted for multiple comparisons. Results: Data from 17 Pediatric and 52 Adult EDs were available for analysis. We found strong evidence of a difference in the number of annual arrivals between Adult (66,275; IQR 56,184-77,702) and Pediatric EDs (25,416; IQR 19,840-29,349) (p < 0.0001). However, “Arrivals per Faculty Clinical Hour” and “Total Arrivals per Treatment Space” showed no differences (both p=1.00). The percentages of visits 1) arriving by EMS, and 2) for behavioral health were significantly higher in Adult EDs (both p < 0.0001). The mean LOS in hours for “All” patients was significantly longer in Adult (median 5.4; IQR 5.0-6.6) than in Pediatric EDs (3.5; IQR 2.9-4.3) (p = 0.017). A similar difference was found for “Discharged” patients (p=0.004). Emergency Severity Index (ESI) categories, professional E&M codes and hospitalization rates suggest higher acuity in Adult EDs (all p < 0.0001). There was no evidence of a difference in mean work Relative Value Units (RVUs) per patient billed (p=0.46) nor was there evidence of a difference in mean RVUs per faculty clinical hour (p=0.91); the same was true for the aggregate distribution of FTE effort dedicated to academics and administration (p=1.00). Conclusions: Significant differences in operational measures exist between academic Adult and Pediatric EDs. These have important implications for operational management of the two types of EDs.

Keywords
Administration, Operations
A Novel Targeted, Task Focused In-situ Simulation Model Can Improve Emergency Preparedness Skills

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Background: Mass casualty incident (MCI) preparedness is critical for both clinical outcomes and staff safety. Unfortunately, traditional training paradigms are time and resource intensive. Targeted, in-situ simulations (“Pocket Drills”) in which a specific skill is developed iteratively through short, task-focused in-situ simulation, is a novel approach to MCI training. We hypothesize that Pocket Drills will improve staff ability to perform critical actions in a simulated MCI. Methods: A multi-center prospective cohort study was performed in one adult and one pediatric urban academic trauma center ED in two states. A 7-point Likert survey was sent to all staff at one study site before and after implementation. For each of 26 consecutive weeks, an unannounced drill occurred in each ED. Time of day and day of week were rotated to capture a representative staff sample. Each PD began with a scripted announcement and ended with the activation of the emergency response plan, followed by a short debriefing. Primary outcome was the number of correctly performed predefined critical actions. Results: 136 staff members participated in at least one drill. Equal numbers of drills were performed during day and night shifts. Average drill duration was 6:06 (m:s) and debrief duration 2:30. Both pre- and post-intervention surveys were completed by 74 staff, of whom 58 (78%) participated in at least one drill. Familiarity with departmental protocols and anticipated comfort during an MCI improved significantly at 6-month follow-up (paired t-test, p < 0.05). Conclusion: A novel approach of targeted, task-focused in-situ Pocket Drills averaged only 6 minutes and needed no staff preparation, showing significant performance improvement over the study period. Importantly, staff members not participating in any drills still reported improved familiarity and comfort with MCI protocols. Though subjective, this suggests that weekly drills develop a culture of readiness within the ED. Our results suggest that Pocket Drills are an effective simulation technique to improve emergency preparedness while preserving ED resources.

Keywords
Disaster Medicine, Simulation, Emergency Medical Services
A Population-Level Analysis of Urologic Intervention Following an Emergency Department Visit for Renal Colic

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Background: Nephrolithiasis is painful and common. Both computed tomography (CT) and ultrasound have been recommended as first line imaging options, and shared decision making (SDM) has been proposed as a method to help guide imaging decisions. However, without CT clinicians are often unable to predict which patients will require urologic intervention, and population-level incidence and timing data is lacking. A better understanding of a patient’s likelihood of needing a procedure would aid clinicians in SDM. Our objectives are to elucidate the natural history of nephrolithiasis - specifically the incidence and timing of urologic procedures in ED patients.Methods: Via a retrospective cohort study utilizing the Massachusetts All Payer Claims Database (APCD), we identified all MA ED visits for renal colic from 2011-2014 in patients age 18-64. We collected personal and ED visit characteristics as well as outcome data. Our primary outcome was incidence and timing of urologic interventions in patients not initially admitted to the hospital. Secondary outcomes included rate and timing of outpatient urologist visits. Using multivariable cox proportional hazards, we modeled time to urologic intervention.Results: There were 66,218 visits for renal colic over 4 years. The mean patient age was 43, and 51% were female. Of all-comers, 5,851 (9%) were admitted to the hospital initially, of which 1774 had a procedure (2.7%). Of patients not initially admitted, 7,654 (12.7%) had a procedure within 60 days. Our model showed that patients with Medicaid were 30% less likely to undergo a procedure (OR 0.70, 95% CI: 0.66-0.74) and 86% less likely to have a follow-up visit with urology (OR 0.14; 95% CI: 0.13-0.14). Conclusions: A minority of patients initially discharged from the ED for renal colic receive a urologic procedure, and patients with Medicaid are considerably less likely to receive a procedure or see a urologist. This longitudinal data can inform shared decision-making, helping both physicians and patients understand a patient’s risk of needing an intervention.

Keywords
renal colic, CT scan, urology
A Quality Intervention Promoting Opioid Alternatives for Back or Neck Pain

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Background
Reduction of opioid use and prescribing in the emergency department is an emerging goal for many. Higher than expected opioid prescribing levels were found at our institution for patients with back or neck pain, and lower than expected use of multimodal analgesia. This quality improvement intervention aims to promote opioid alternative interventions in our ED for patients with neck and back pain.

Methods
A brief printed reference with details regarding suggested opioid alternative medications and doses was created. In association Baystate Physical Therapy (PT) we implemented a mechanism for PT referral directly from the ED, bypassing the previously required primary physician referral. A streamlined PT referral form was integrated into our electronic discharge instructions. We then presented a case-based didactic presentation to residents, attendings, and PAs/NPs, and provided spaced-repetition reinforcement via e-mailed summary with copies of our printed reference. Pre and post intervention consecutive samples of 100 patient visits were pulled for abstraction by final ICD-10 code for neck or back pain and evaluated for use of opioids and opioid alternatives.

Results
Prior to the intervention, 34% of patients were administered an opioid analgesic in the ED and 24% were discharged with an opioid prescription, compared with 24% and 9% post. 39% were given an NSAID in the ED and 21% were given acetaminophen in the ED prior compared to 41% and 38% post. Topical lidocaine was prescribed 0% prior and 8% post. Since February 2018 at least 16 patients followed up with PT following an ED referral, although this endpoint is difficult to capture and likely underreported.

Conclusions
There was a decrease in opioid use for back or neck pain following this quality intervention. Although we are unable to control for similar coexisting efforts such as new statewide restrictions on opioid prescribing, it may be reasonable for institutions to create a set of recommendations for multimodal analgesia, provide education to prescribers, and to facilitate opioid alternatives such as physical therapy.

Keywords
Opioid, back pain, quality improvement
A Retrospective Cohort Study of Acute Epiglottitis in Adults

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Background: Epiglottitis in the adult population remains a distinct disease process from pediatric epiglottitis in its microbiology, presentation, and clinical course. While traditionally considered a more indolent and benign disease, acute epiglottitis in adults remains a cause of acute airway compromise with mortality reported at anywhere from 1% to 20%. Our objective was to characterize the disease course and evaluate the rate and type of airway management in this population at a tertiary academic referral center.

Methods: Via retrospective chart review we identified all adult patients (age >/= 18) who were definitively diagnosed with epiglottitis, supraglottitis, or epiglottic abscess by direct or indirect laryngoscopy during a 9 year period. Using double data abstraction and a standardized data collection form, we assessed patient characteristics, presenting features, and clinical course. Our primary outcome was airway management by intubation, cricothyroidotomy, or tracheostomy. Our secondary outcome was mortality.

Results: Eighty-eight patients met inclusion criteria. The mean age was 50.6 years (sd 17.2) and 59.1% of patients were male. Only 13.6% of the patients were diabetic. Half (50%) had symptoms that were present for >/= 48 hours in duration, 28.4% had voice changes, and 10.2% had stridor noted in the ED. Other presenting symptoms included fever (15.7%), odynophagia (37.5%), and dysphagia (47.7%). Fifteen patients (17%) underwent acute airway management, 3 undergoing emergent cricothyroidotomy, and 2 undergoing tracheostomy. Two patients died and one suffered anoxic brain injury as the result of airway complications.

Discussion: While the majority of patients did not require airway intervention, a third of those who did had a surgical airway performed, with 2 deaths and one anoxic brain injury. Clinicians must remain vigilant to identify signs of impending airway compromise in acute epiglottitis and be familiar with difficult and failed airway algorithms in order to prevent morbidity and mortality related to airway complications.

Keywords
epiglottitis, difficult airway
A Scoping Review to Enable Shared Decision-Making Regarding Diagnostic Imaging for Renal Colic

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Background: Two million CTs are performed annually in US EDs for suspected kidney stones, but ultrasound is a viable diagnostic alternative. As there are tradeoffs between each, physicians have recognized this scenario as appropriate for Shared Decision-Making. Via stakeholder engagement, we identified concepts most relevant to patients and physicians, including safety, accuracy, cost, length of stay, prognosis, and procedure rates. Through a scoping review, we sought to explore the consequences of the decision between US and CT in regards to patient and physician centered outcomes. Methods: We used Arksey and O’Malley’s scoping review methodology to perform an exhaustive search of articles via Pubmed, EMBASE, web of science conference proceedings index, and Google Scholar. Inclusion criteria included “urolithiasis” (and synonyms), “emergency care", and ability to answer predeterminded, stakeholder-generated questions. Two authors double-screened abstracts for inclusion. The remaining full text articles were analyzed, categorized, and summarized to provide a comprehensive view of the clinically relevant and currently available research. Results: The initial search yielded 2162 citations. After exclusions, 439 were included. Most articles (264) examined the diagnostic accuracy of the imaging modalities, including one randomized control trial comparing CT to ultrasound. Seventy-six studies addressed prognostication, including two randomized control trials exploring the choice of radiologic investigation and effect on surgical intervention. Fourteen studies related to healthcare and patient costs. Many of the stakeholder-generated questions were addressed, but study quality was often low with a moderate-high risk of bias. Although the accuracy of CT scan, low dose CT, and ultrasound have been subject to significant study, few of these studies included patient-centered outcomes. Rates of dangerous alternative diagnoses and urologic procedures were markedly variable. Conclusion: There is a plethora of data related to imaging accuracy and radiation exposure to enable Shared Decision-Making in the diagnosis of renal colic, although of variable quality. There is considerably less data regarding patient-centered outcomes such as procedure rate, cost, length of stay, and the harms of incidental findings.

Keywords
Shared Decision making, Scoping Review, Renal Colic, CT, Ultrasound
Acute Respiratory Distress from Cement Dust Exposure

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Background: Cement is one of the most widespread substances used in construction. Cement exposure has been previously linked to chronic respiratory disease. Acute respiratory exposures with immediate sequelae have been infrequently described. 

Aims: This report describes a man who developed multifocal pneumonitis and respiratory failure requiring intubation one day after exposure to cement dust. 

Methods: This is a single patient retrospective chart review. A 47-year-old male construction worker without prior lung disease was exposed to a cloud of concrete dust during mixing. The following day, he developed hypoxic respiratory failure with bilateral multifocal airspace disease. He was intubated and admitted to the medical intensive care unit where he was treated with intravenous steroids and lung-protective ventilation. He was extubated on hospital day three and discharged on a prednisone taper. On follow-up one month after discharge, he was asymptomatic. 

Results: The few existing reports of acute respiratory symptoms after cement dust inhalation describe subjective shortness of breath, nasal congestion, and decrease in peak expiratory flow. This case describes acute hypoxic respiratory failure with acute respiratory distress syndrome (ARDS) after exposure. We theorize that there may be an irritant component to cement inhalation as the chromium, cobalt, and nickel components in cement are known irritants. Sand and gravel in cement may cause direct abrasive injury. Cement undergoes an exothermic reaction when mixed with water. Inhalation may cause direct thermal injury. The silicon dioxide component has been shown to cause pulmonary injury through cytokine-mediated inflammation. 

Conclusions: Cement batches for smaller-scale construction jobs are often mixed on-site increasing exposure risk. Implementation of proper personal protective equipment has been shown to reduce respiratory symptoms among cement workers. This report of acute respiratory failure after cement exposure underscores the need for occupational health standards and further research.

Keywords  
Pulmonary, Toxicology/Environmental
Affective, Cognitive, and Behavioral Outcomes from a Resident Personal Finance Curriculum Pilot Project

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Background: Financial health is a key aspect of resident wellness. Efforts have been made to improve the financial knowledge and wellbeing of residents; however, interventions to date are limited in scope, scalability, and evidence of impact. The purpose of this study was to develop and assess affective, cognitive, and behavioral outcomes of a targeted personal finance curriculum designed for ease of implementation.

Methods: Curricular design was informed by two recently published needs assessments: Content focused on education debt, disability and life insurance, investing, and financial advisors; delivery involved weekly online module completion using the course website (MDintheBlack.com), a Q&A webinar, pre- and post-curricular knowledge assessments, and an assessment of behavioral changes. Assessment and evaluation forms were delivered electronically to participants at the beginning and end of the curriculum. The pilot was implemented at an urban emergency medicine program over 5 weeks.

Results: Twenty (20/49, 41%) residents enrolled in the course. Most residents agreed or strongly agreed that the content was relevant (20/20, 100%) and clearly presented (19/20, 95%), and that they would recommend the curriculum to other residents (20/20, 100%). Performance on the knowledge assessment improved 21% after the intervention (pre: 57%, post: 78%; P < .001; Cohen’s d = 1.23). Most residents also reported behavioral changes (17/20, 85%) with non-exclusive categories of behavioral changes including setting new financial goals (12/20, 60%), taking new action toward financial planning (11/20, 55%), and changing financial habits (6/20, 30%). Faculty effort was 2 hours for the webinar plus sending templated emails.

Conclusions: This approach to personal finance education was strongly endorsed by residents and achieved significant cognitive and behavioral outcomes with minimal implementation requirements. Future efforts will refine curricular scalability as it is deployed at 20 additional programs this year.

Keywords
personal finance, curriculum development, wellness, resiliency
After the CRASH(2): Variable Adoption of Tranexamic Acid for Trauma in Statewide EMS Treatment Protocols

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Background: Tranexamic acid (TXA) is an antifibrinolytic used for decades to treat dental and vaginal bleeding. Recent evidence (CRASH-2 and MATTERs) demonstrated a mortality benefit when used within 3 hours of traumatic injury with suspected hemorrhagic shock. Given the time dependent benefit of TXA, which may be maximized by early administration in the field, TXA has entered the EMS pharmacopeia despite a paucity of research in the prehospital environment. The purpose of this investigation is to describe the extent to which TXA has been incorporated into statewide treatment protocols (STPs), and characterize the indications for its use. Methods: Cross sectional study of STPs utilizing a standardized review for inclusion of TXA in Paramedic level protocols, as well characteristics of the protocols. Protocol revision date was also captured.

Results: Thirty three out of fifty states issue Paramedic/ALS STPs or guidelines. TXA is included in 11 (34%) of these as an approved medication, but with specific protocols in only 10 states. Three special cases exist, Massachusetts, which includes TXA as a medical director option with an explicit statewide protocol, North Carolina, which offers TXA as a medical director option but does not have a statewide protocol for TXA, and Ohio, which includes a specific TXA protocol for tactical emergency casualty care, but does not have a protocol for routine trauma care. Of states with TXA protocols, 8 (80%) offered specific guidance on administration using systolic blood pressure 110bpm thresholds. Time >greater than 3 hours from injury was a contraindication for use of TXA in 7 (70%) of protocols. Pediatric dosing was included in 2 (20%), and provision for repeat or infusion dosing was included in 2 (20%) of protocols.

Discussion: While the benefit of TXA in the prehospital setting has yet to be proven, 34% of STP states include TXA in their pharmacopia. The majority of protocols mirror the criteria used in the CRASH-2 study while others provide little guidance on its use. Further study is needed to examine the efficacy and safety of prehospital TXA administration by paramedics as well as determination of optimal criteria for administration in STPs.

Keywords
Trauma, Pharmacology, EMS, Operations/Protocols

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
Agreement and Challenges in HEART Score Electrocardiogram Classification: A Mixed Methods Study

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Background: The HEART Score, a clinical decision aid for emergency department (ED) patients with chest pain, incorporates subjective variables that clinicians must interpret, like electrocardiograms (ECG’s). However, instructions to correctly score ECG’s are limited. Further, a single point separates low and high-risk patients, making correct ECG scoring vital. Our study assessed the inter-rater agreement of HEART score ECG classification and identified common ECG patterns difficult to score.

Methods: A prospective observational study was performed at a single academic center comparing ED providers’ clinical HEART scores with scores derived through structured data collection. A convenience sample of adult patients presenting with symptoms concerning for acute coronary syndrome were included. ED providers using the HEART score were asked to complete a survey detailing their score, including their ECG classification. ED’s were then independently reviewed and scored by two board-certified emergency physicians engaged in HEART score research. First, the researchers categorized each ECG according to published predefined criteria. Researchers then discussed common challenges to ECG scoring and independently re-categorized ECG’s. Finally, researchers identified ECG’s with conflicting scores and discussed the patterns that led to differences.

Agreement and weighted kappa (WK) were used to compare scores. Results: During the 24-month study, 288 provider patient pairs were enrolled. Using predefined criteria, researchers independently agreed on 75.4% of ECG’s (WK 0.64). After discussing challenges and re-categorizing, agreement improved to 85%(WK 0.72). The most common reason for scoring differences in the 42 remaining ECG’s included: diffuse flattening of T-waves (13), lateral T wave inversions (11), ECG artifact (3), and biphasic V2 or V3 (3). The final research scores agreed with ED provider’s ECG classification in 71.2% of cases (WK 0.48), including 3 cases in which scores diverged by 2 points.

Conclusion: Even when scored by ED physician experts, inter-rater agreement on HEART score ECG classification remained only moderate to good. Common ECG patterns in conflicting scores included T wave flattening and lateral T wave inversions, both of which are not defined in published criteria.

Keywords
HEART Score, Electrocardiogram, Agreement
Ambulance Transport for Pediatric Asthma Is Associated With Higher Overall Emergency Medical Services Utilization

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Background: Asthma is among the most common emergency department (ED) diagnoses for children who experience multiple ED visits per year, as well as a frequent cause of emergency medical services (EMS) usage in the pediatric population. High rates of ED and EMS utilization for childhood asthma incur significant economic costs and are often linked to poor disease control. The purpose of this study is to determine whether EMS transport for pediatric asthma is generally indicative of increased ED and EMS utilization, a question uncharacterized in the literature.

Methods: A retrospective chart review was conducted to identify all patients under 18 years of age who presented to a large pediatric ED during 2016 and received a primary asthma-related admitting or discharge diagnosis (ICD-10-CM code J45.xx). A total of 52,855 patient encounters were queried, yielding 1685 encounters meeting search criteria. A random sample of 1037 charts (61.5%) were assessed for eligibility, of which 955 met inclusion criteria for the study. EMS versus non-EMS arrivals were compared by total number of pediatric ED visits in 2016 (1) for any cause, (2) for respiratory complaints, and (3) for which the patient arrived via EMS. Interfacility transfers (n = 27) were excluded from analysis.

Results: Ambulance arrivals comprised a minority of pediatric ED asthma patients, with EMS transports representing 94 (9.8%) of the included charts. No difference was noted in the mean number of ED visits for EMS patients and non-EMS arrivals (2.30, 95% CI 1.97 - 2.63 vs. 2.47, 95% CI 2.35 - 2.60; p = 0.35). Similarly, the mean number of respiratory ED visits for EMS patients was comparable to the non-EMS group (1.96, 95% CI 1.69 - 2.23 vs. 2.00, 95% CI 1.90 - 2.10; p = 0.78). In contrast, the mean number of EMS transports to the ED was significantly higher in the EMS group than among non-EMS arrivals (1.30, 95% CI 1.16 - 1.43 vs. 0.11, 95% CI 0.08 – 0.13; p < 0.001).

Conclusion: Asthmatic children who were transported by EMS did not have higher rates of pediatric ED visits. EMS transport for pediatric asthma was, however, significantly associated with greater overall EMS utilization. Further research is needed to determine whether EMS usage in this population, rather than indicating frequent acute health care utilization more broadly, is instead related to factors such as geography, access to transportation, or insurance status.

Keywords
Emergency Medical Services, Asthma, Pediatrics

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An electronic clinical decision tool reduces unnecessary tetanus vaccinations in the emergency department

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Background: Updating tetanus vaccinations for patients presenting to the emergency department with wounds is common, although often patients do not have good recollection of their prior immunization history. Tetanus updates are suggested if the prior vaccination was more than ten years ago, or for contaminated wounds if the prior update was more than five years ago. Patient’s immunization history may not be accurate in the Electronic Health Record (EHR), and when it is emergency providers may not be reviewing this data prior to ordering a tetanus booster. We studied the effect of a real-time electronic Clinical Decision Support (CDS) tool that warns providers upon ordering a tetanus vaccination update that the patient has a documented prior vaccination within the last ten years. The primary outcome was a reduction in unnecessary tetanus vaccinations in the emergency department.

Methods: This was a prospective quasi-experimental trial in three hospital EDs (two academic and one community). We studied adults where the ED provider ordered a tetanus booster vaccination. The study was conducted in two equal length phases between December 2016 and April 2017. The CDS alert was silent to ED providers in the initial baseline phase, and visible in the intervention phase. We compared the rate of administration of a tetanus booster vaccination during the ED encounter in each study phase. The alert displays guidance text on when tetanus boosters are indicated, and provides a link to Immunization report where the date of their most recent tetanus vaccination can be reviewed. The tetanus vaccination order can be removed directly from the alert.

Results: For the eligible population of 60,983 ED encounters, the rate of documented prior tetanus vaccination in the EHR within the last five and ten years was 22% and 35% respectively. Of the eligible population, 339 were included in the study population as they had a tetanus vaccination ordered with a prior documented history of vaccination within the last ten years. The median age was 51 years and 54% were female. During the baseline monitoring phase, a tetanus vaccination was administered 91% of the time the order was placed, compared to 55% in the intervention phase (OR = 0.12; 95% CI 0.07 to 0.22).

Conclusion: A simple CDS tool that warns users that a patient may have an up-to-date tetanus status reduces potentially unnecessary vaccinations.

Keywords
clinical decision support
An Emergency Department’s Response to a Statewide Hepatitis A Outbreak

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Background: Acute hepatitis A is a highly contagious viral and certain patients at higher risk of contracting hepatitis A include those who are: homeless, use illicit substances, and engage in sexual contact with other men. Between April - July 2018, the start of a hepatitis A outbreak was identified in Massachusetts with 10 cases reported to the Massachusetts Department of Public Health (MA DPH) in predominantly homeless men with substance use disorder. The MA DPH issued an advisory in August 2018 urging EDs to vaccinate high risk individuals. Our ED quickly created a process by which to address this public health emergency. Methods: At a large urban academic institution that cares for a majority of the city’s patients suffering from homelessness and substance use disorder, leadership from EM, infectious disease, and pharmacy developed a streamlined process to administer the Hepatitis A vaccine to high risk patients in the ED. The aim of this quality improvement process was to vaccinate high risk ED patients, including those with: homelessness, illicit drug use, chronic liver disease, recent incarceration, or recent anal sexual contact. An electronic health record report queried all Hepatitis A vaccine orders in the ED. Chart review identified the total number of Hepatitis A vaccine orders and the percentage of eligible patients identified by ED provider or pharmacist. Results: There were 73 hepatitis A vaccine orders for ED patients from August 15 – December 31, 2018. Approximately 84% of orders were administered. Patients did not receive the vaccine due to: refusal (67%), confirmed previous Hepatitis A vaccination (25%), and left against medical advice (8%). ED pharmacists identified eligible patients and recommended that the ED provider order the vaccine in approximately 20% of all orders. All patients receiving the vaccine met the high risk criteria of homelessness or substance use. Conclusions: This quality improvement initiative highlights a successful collaborative response to a public health emergency. ED administration of the Hepatitis A vaccine to high risk individuals is feasible and helps support statewide efforts to curb an outbreak through mass vaccination. Vaccination refusal may be underestimated as providers may not place an order if the patient declined the vaccination offer or provider noted that the patient was previously vaccinated.

Keywords
quality improvement, hepatitis a, public health
Are Hospitals C.O.D.E (Clinical, Operational, Disaster, and Emergency) Terminology Standardised

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BACKGROUND: Healthcare facilities frequently use disaster codes as a way to communicate with employees that an emergency or incident is occurring. As increasing numbers of providers work at multiple facilities, and healthcare systems continue to build disaster response teams and protocols covering multiple facilities, standardization of disaster code terminology is critical. Lack of consistency in terminology can potentially have a devastating impact on the understanding and response of visiting or relief staff. METHOD: To evaluate the level of standardization in terminology of disaster codes in healthcare facilities. A convenience sample was taken from a private Facebook™ group consisting of emergency department nurses from a wide range of facilities. The Facebook™ group was asked to share their hospital disaster codes. Of the 40,179 total members, 78 commented including 55 photos of quick reference badges, and the rest were descriptions/lists of codes. One badge was excluded due to a blurry photograph. Results were collated and analyzed for trends and standardization. RESULTSThe most common codes were, “Code Red” for fire (72.7%), “Code Blue” for cardiac arrest (44.9%), “Code Silver” for active shooter/weapons event (37.7%) and “Code Orange” for hazardous materials (33.8%). There were 168 instances of a code term being associated with a particular event by five or fewer facilities. Two facilities used numeric systems, with 11 using plain language descriptions. CONCLUSION: Disaster code language is inconsistent. Few of the codes were consistently assigned to the same meaning, and none were universal. Color coding was the most common method, but there was little consistency even within color code systems. Additionally, some facilities used a combination of colors, numbers, terms and plain language. Healthcare facilities should embrace standard terminology and create consistent language for disaster codes to enhance response capabilities and medical security.

Keywords
Emergency ManagementDisaster ManagementHospital CODE TerminologyClinical operationsDisaster operationsContinuity of operations
Assessing the burden of mental illness among refugees in Uganda

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Background: Stressors in humanitarian settings such as poverty, human rights violations, violence, and disrupted social relations, may worsen mental health. We sought to estimate the prevalence of mental illnesses among refugees accessing health services in Nakivale Refugee Settlement and to compare the burden of illness in this population with Ugandan nationals living in the surrounding community. Methods: From March 16, 2018 to November 23, 2018, we enrolled participants from the clinic waiting areas at 3 health centers in Nakivale. We collected demographic information including country of origin and years living in the settlement. We administered validated scales adapted for use in the local context to measure symptoms of post-traumatic stress disorder (Post-traumatic Stress Disorder Checklist-Civilian Version 6-item scale, threshold score ≥ 14), depression (Patient Health Questionnaire 9-item scale, threshold score ≥ 10), and anxiety (Generalized Anxiety Disorder 7-item scale, threshold score ≥ 10). Results: Of 2,842 participants, there were 1,904 (67%) refugees and 938 (33%) Ugandan nationals. Compared to Ugandan nationals, refugees were less often female (52% vs 57%, p=0.017) and were younger (median age 30 vs 31, p<0.001). The refugees had a significantly higher percentage who screened positive for post-traumatic stress disorder (45% vs 36%, p < 0.001), depression (27% vs 22%, p=0.002), and anxiety (23% vs 18%, p < 0.001). Among refugees, we observed differences by country of origin in the percentage screening positive for post-traumatic stress disorder (50% Rwanda, 44% Burundi, 42% Democratic Republic of the Congo, 49% Other, p=0.030), but not depression (p=0.58) or anxiety (p=0.68). Among the refugees, we observed no difference by duration of time in the settlement in the percentage screening positive for post-traumatic stress disorder (p=0.16), depression (p=0.34), or anxiety (p=0.19). Conclusion: In this large outpatient clinic-based study, a substantial percentage of refugees and Ugandan nationals screened positive for post-traumatic stress disorder, depression and anxiety; the burden of mental illness was higher for refugees. These findings suggest that mental health screening in the outpatient clinic, if paired with appropriate treatment, may be an effective intervention to reduce the burden of mental illness among refugees.

Keywords
refugee, Uganda, mental health, depression, anxiety, post-traumatic stress disorder
Assessment of Correlation Between Performance on the ABEM In-Training Exam and a Commercial Mock Exam

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Background: Many emergency medicine (EM) programs utilize commercially available testing resources as a study aid for the ABEM in-training examination (ITE) as well as for the ABEM qualifying board examination. There is little independent data correlating the results of these exams to the ABEM ITE. Identifying a question bank that correlates with the ABEM ITE will assist EM residencies in identifying trainees at risk of poor performance on the ABEM ITE during their first year and act as a mid-year assessment to identify residents failing to progress and who are at risk of poor ITE performance in subsequent years of training. Methods: This study was a retrospective review of examination scores from 2014-2018 at a single EM residency. Data was collected by the program director and de-identified and randomly assigned a numeric identifier. Researchers used the Pearson correlation coefficient and the 95% CI were calculated by class year and PGY. The correlation was tested against no correlation. A p-value smaller than 5% was deemed to be statistically significant and the null hypothesis of “no correlation” was rejected. Results: Full data sets were obtained for the years 2018, 2017 and partial datasets were obtained for the 2016 and 2015 years. 2014 was excluded due to missing data. Correlations were calculated for each year a class performed the ROSH Mock exam and ITE exam. The exam scores correlated across all three EM classes in 2018 with a p-value of 0.04, 0.001, and <0.0001 for PGY 3, 2 and 1 classes respectively. Prior to 2018 there was no correlation between the ROSH mock exam and the ABEM ITE scores. Conclusion: Analysis of three years of exam scores suggested that there is incomplete correlation between the ROSH Review mock exam and the ABEM ITE. There may have been confounders such as a change in resident study habits or development of questions that better mimic the ABEM ITE, or resident use of ancillary resources during the mock tests. Use of data from a single residency and limited datasets prior to 2016 were limitations of this project. Areas for further study include assessing whether the emerging correlation in 2018 will continue as well as a multi center investigation.

Keywords  
In-training, mock exam, board exam
Assessment of the IDEALS Method of Bad News Delivery in the Emergency Department

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Background: Breaking bad news (BBN) is difficult in the ED. Current research on BBN teaching is primarily outside of the ED. EM residents are often tasked with this responsibility. Previous studies have shown residents feel significantly more confident with BBN after IDEALS training. We hypothesized that a brief structured curriculum of the novel IDEALS method of bad news delivery would increase bad news delivery skill. Methods: This was a blinded single-site prospective randomized trial conducted at an urban tertiary care hospital with a three-year EM residency. All 39 EM residents were eligible for the study. Residents were randomized to receive the BBN curriculum teaching the IDEALS method of bad news delivery using a short presentation and supervised small group role playing activity. Residents volunteered for pre-intervention and post-intervention assessments. Each assessment included a case simulation in which they inform an actor playing a family member of a new critical illness and subsequently disclose the patient’s death in a second interaction. Interaction videos were evaluated by three independent graders trained by the study team using a slight modification of a validated tool. Graders were blinded to curriculum details, participant names, intervention arm, and order of the cases. Cases were assigned in random order. Mann-Whitney U test was used for significance testing. Results: Seventeen of 39 residents (44%) completed the project. Two individuals were excluded due to video malfunction leaving 15 participants for final analysis. There were no differences between the groups in terms of demographics or prior BBN training. Inter-rater reliability for video scoring was moderate overall (0.552). There was no significant difference in score between intervention and control arms (mean score control group 69.0 ± 1.77 in first assessment and 67.2 ± 2.38 in the second assessment, p = 0.85; mean score in the intervention group 69.2 ± 1.82 in the first assessment and 70.0 ± 1.55 in the second assessment, p = 1). Conclusions: While there was a trend toward improved scores, there was no statistical difference in BBN scores between individuals who received a brief BBN curriculum and those that did not. The study was limited by size and power. A larger sample population would be needed to assess for improvement in breaking bad news skill.

Keywords  
Breaking Bad News, Communication
Barriers and Facilitators to the Evidence Based Diagnosis of Pulmonary Embolism: A Qualitative Analysis

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Background: Providers often pursue imaging in patients at low risk of pulmonary embolism (PE), resulting in imaging yields <10% and false positive CT rates 10-25%. Attempts to curb overtesting have had only modest success and no studies have been informed by implementation frameworks. The objective of this study was to identify barriers and facilitators to adoption of evidence-based diagnostic testing for PE. Methods: We recruited a purposeful sample of providers and conducted semi-structured interviews, which were recorded, transcribed, and supplemented by session notes. Our interview guide focused on approaches to the workup of PE and barriers and facilitators to the use of risk stratification tools, including the Wells and PERC. We asked participants about potential implementation strategies such as computerized clinical decision support (CDS) and audit-feedback. Using a directed qualitative content analysis approach, 2 members of the team performed blinded coding of the transcripts in an iterative process, with an initial codebook developed based on the Consolidated Framework for Implementation Research and Theoretical Domains Framework. Results: We interviewed 15 providers from 3 hospital systems in Massachusetts. Provider level barriers predominated. Providers reported rarely calculating a formal Wells score or following validated risk cut-offs in Wells. They were also unlikely to use the d-dimer or Wells when they perceived patients as high risk based on gestalt, in patients with a history of venous thromboembolism or cancer and in cases they believed had PE as the primary diagnosis.. All providers identified an institution-endorsed policy as a major facilitator to using risk stratification tools. Most providers felt audit-feedback with peer comparison about imaging yield would be helpful. The perception of a CDS tool for PE as adding steps with little value also emerged as a barrier; participants reported they would override CDS interventions because they had already made the decision. Conclusion: Overall, provider-level factors such as reliance on gestalt and variability interpreting the Wells scoring system are barriers to the use of risk stratification tools for PE. An inner setting facilitator such as institutional guidelines on testing for PE and audit-feedback emerged as promising means to increase provider use of risk stratification tools.

Keywords
implementation science, pulmonary embolism, evidence-based medicine
Background: Duty hour limitations and the rapid pace of care in the ED may limit the number of hands-on emergency medicine training opportunities that are available to residents regarding basic splinting procedures. To date, there has not been a study on whether emergency medicine residents are aided by clinical skills training on management of orthopedic injuries. This study aims to determine if a dedicated hands-on educational session will improve the knowledge of the utility and application of splints and basic management of osseous injuries among first year emergency medicine residents. Methods: We performed a single-center, prospective study comparing first year residents’ level of comfort and knowledge of proper splint application. Likert-type scale. Knowledge was assessed with a 15-question multiple choice and short-answer survey asking about technique, splint application for osseous injuries and complications. This was performed before and after a one-hour educational seminar followed by a one-hour hands-on session. Surveys were anonymous and were tracked with a unique identifier. Results: There were significant improvements in level of comfort with splint application, materials and patient education were found after the educational seminar and hands-on session (p < 0.001 for all three areas). Participants showed a gain in knowledge regarding the numbers of layers of plaster to use (p < 0.001), splint width for upper and lower extremity (p < 0.05), indications for upper extremity splints (p < 0.008) and benefits to splinting over casting osseous injuries (p < 0.001). However, there was no significant improvement in knowledge of post-discharge instructions for patients, need for documentation of physical exam findings after splint application or complications of improper splinting. Conclusion: This study demonstrates that a brief educational intervention provided statistically significant improvements in personal confidence and knowledge of splint application and management of osseous injuries. However, it also suggests that additional sessions may be necessary for residents to be able to fully understand and manage complications of common ED splinting techniques.

Keywords
Orthopedic injuries, simulation, education, emergency medicine, residents
Characteristics of Children with Suspected Dengue Fever During an Outbreak

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Background: Dengue is a mosquito-borne viral illness that can range from a mild febrile illness to hemorrhage and shock. It is most prevalent throughout the tropics, however, there has been increased incidence in North America. Our objective is to describe the characteristics of children who present with fever and suspected dengue during an outbreak.

Methods: Prospective, consecutive enrollment study. Non-toxic children 3 months to 16 years with suspected dengue who presented to a pediatric hospital in Siem Reap, Cambodia were screened. Enrollment occurred over a 14-day period during a nation-wide dengue outbreak. Subjects were categorized as suspected dengue 1) with warning signs and 2) without, as per WHO guidelines. Patient demographics, vital signs, symptoms, laboratory findings and disposition were recorded. Blinded follow-up was conducted by telephone after 7-10 days to determine worsening of disease requiring admission. Data was analyzed using descriptive statistics and post-hoc subgroup analysis using Fisher’s exact test.

Results: A total of 155 subjects were enrolled. This represented 7.9% of children who presented during the study period. Average age was 7.6 years and 47% of subjects were female. Average day of illness at presentation was 3.7 days. The most common symptoms were fever (100%) and anorexia/nausea (65.8%). Dengue warning signs were present in 49.7%. The most common warning sign was abdominal pain, present in 72.7% of that subgroup. Overall, 19.3% required admission – 5.8% at the time of initial presentation and 13.5% during the follow-up period. Findings that were significantly different between the subgroups of admitted and non-admitted subjects were persistent vomiting (16.7% versus 4.8%, \( p = 0.04 \)) and low platelet count (50% versus 18.5%, \( p = 0.002 \)). In total, 10.3% of subjects were lost to follow-up. Clinical severity, presence of warning signs, was not significantly different between successful or failed follow-up subgroups (49% vs 56.3%, \( p = 0.8 \)).

Conclusions: In children presenting with fever and suspected dengue during an outbreak, anorexia/nausea was the most common symptom. Abdominal pain was the most common warning sign. Persistent vomiting and low platelet count were the findings most prevalent in children who required hospital admission.

Keywords
Infectious Disease, Global Health, Pediatrics, Dengue Fever
Chemical Warfare Agent Terrorist Attacks in Latin America and the Caribbean region

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Background: In the past five decades, the region of Latin America and the Caribbean (LAC) has been subject to several types of terrorist attacks; most committed by local terrorist organizations however there have also been attacks by international terrorist groups. Internationally, terrorist attacks are increasing in both frequency and complexity. Significant concerns exist regarding the use of Chemical-Warfare Agents (CWAs) in civilian settings. Asphyxiants (ex: cyanide), opioids (ex: fentanyl), and nerve agents (ex: sarin) represent some of the most lethal CWAs. To date, there is very little published data on their use in the LAC region despite the fact that the recent attacks in Syria have sparked international interest in the use and regulation of CWAs. Methods: To improve civilian health service preparedness to respond to CWAs attacks by describing the types of agents historically used within the LAC region. Information was extracted and analyzed from the open-source Global Terrorist Database hosted by the University of Maryland, regarding CWA-LAC from January 1, 1970, to December 31, 2017. Results: During the forty-seven year period reviewed there were 29,846 terrorist attacks in the LAC region, with 63.6% occurring in the southern region. A total of 29 CWA attacks were reported, with the most common agents being tear gas (37%), and cyanide (29.6%). The most frequent targets were religious figures/institutions (22.2%), law enforcement (18.5%), and government agencies/personnel (18.5%). Conclusion: Cyanide is one of the most prevalent agents used for Chemical Weapons Attacks in the LAC region. Preparedness should be enhanced for CWA terrorist attacks, especially involving cyanide, given its life-threatening nature, prevalence, and the existence of reversal agents. First responders, physicians, and nurses should be aware of this potential hazard and train to respond appropriately. Additionally, regional stockpiles of antidotes should be considered by governmental bodies within the LAC region.

Keywords  
Chemical weapons Terrorism Disaster Medicine Emergency Management Special Operations Medicine Counter-terrorism Medicine
Background: The HEART Score decision aid may help reduce admissions for chest pain in patients with a low risk of major adverse cardiac events. However, the subjective nature of HEART score variables may influence clinical utility when incorporated outside of a research setting. Our objective was to determine the agreement between HEART scores during clinical practice and those calculated using a structured research format.

Methods: This prospective observational study was conducted at a single tertiary center. A convenience sample of adult patients who presented with symptoms concerning for acute coronary syndrome were included. Emergency providers who used the HEART score during clinical practice were asked to complete a survey detailing their score. Providers received no special training or aides to assist in HEART score calculations. Patients then completed a structured interview with a trained associate to generate data for an independent research HEART score. Patients were followed by phone and chart review at 6 weeks to evaluate for major adverse cardiac events (acute coronary syndrome, bypass surgery, cardiac catheterization). Simple agreement, weighted kappa, and test probabilities were calculated.

Results: Between November 2016 and December 2018, 288 provider patient pairs were enrolled. Patients were evaluated by senior residents (126, 44%), advanced practitioners (86, 30%), and attending providers (76, 26%). Of the 288 patients, 219 (76%) were admitted and 43 (15%) had at least 1 major adverse cardiac event. Agreement was moderate for history (46% kappa 0.19), risk factors (69% kappa 0.59) and electrocardiogram (71%, kappa 0.47) variables. Overall agreement on dichotomized high vs low-risk patients was high (80%, kappa 0.51). Compared to researchers, providers’ HEART scores had higher sensitivity (93%, 95%CI 81%-99% vs 86%, 95%CI 72%-95%) and discrimination (area under the curve 0.72, 95%CI 0.64-0.80 vs 0.69, 95%CI 0.60-0.77) for major adverse cardiac events. Providers admitted 30% (23/79) of low-risk HEART score patients, none of whom had an acute coronary syndrome.

Conclusion: This single site study found that emergency providers have comparable sensitivity and discrimination in HEART scores compared to researchers. A multicenter validation study is warranted to evaluate the utility of the HEART score in diverse clinical settings.

Keywords
HEART Score, major adverse cardiac events, agreement
Clinical Practice Guideline Reduces Evaluation and Treatment for Febrile Infants

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Background: Invasive bacterial infection (IBI) occurs in 7-10% of infants less than 90 days of age with fever, and is associated with significant morbidity and mortality. Despite risk-stratification criteria published in the past two decades, practice variation remains. Clinical practice guidelines (CPGs) can expedite care and standardize management. Our study assessed changes in clinical decision-making following implementation of Febrile Neonate CPG in a pediatric emergency department (PED) with a goal to reduce testing and treatment. Methods: We conducted a retrospective observational study of infants ages 0-56 days presenting with fever to the PED of a tertiary care hospital. The CPG stratified risk and outlined diagnostic evaluation and empiric treatment for IBI and herpes simplex virus (HSV) infection. Patients at higher risk for meningitis included those with laborator...
Comparing the Accuracy of Micro-Focus X-ray to Standard Ultrasound for Identifying Small Fractures

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Background: Fractures are found in many traumatic injuries. However, up to 2/3 of these are initially missed, leading to: delayed healing, additional procedures, and loss of function. Point of Care Ultrasound (POCUS) is now considered reliable for detecting fractures. Micro Focus X-ray Imaging (MFXI) is a new, compact technology that can be used at Point of Care (POC) and has a 100-fold increased resolution as compared to conventional X-ray. This study compared the accuracy of MFXI and POCUS for the detection of fractures using chicken bones. Methods: Up to four small fractures were created in six chicken wings and seven thighs using chisels, knife and pliers. Three control samples were prepared with no fractures to confirm reliability. Two Emergency Medicine physicians with US training imaged the chicken pieces with a linear-array (15–4 MHz) transducer using a uSmart® Terason 3200T US (Burlington, MA). The number of fractures in each piece of chicken were recorded. The chicken pieces were then imaged with a True Focus X-ray tube, model TFX-3110EW (Tungsten anode and a 10 &mu;m focus) operated at 80-kV anode voltage. The chicken was placed 1.2 m below a 12-bit remote RadEye 200 CMOS detector with 100-um spatial resolution in a vertical imaging arrangement with a 1.6 m source to detector distance. The two physicians, blinded to the chicken pieces, counted the number of fractures in each x-ray image. Interrater reliability was calculated to estimate the level of agreement between raters. Accuracy rates were compared between raters while adjusting for clustering by rater (p-values reflect adjusted comparisons). Results: Physicians identified 38/58 fractures using MFXI (66% accuracy; 75% inter-rater reliability) and 41/58 fractures using POCUS (71% accuracy; 38% inter-rater reliability). MFXI demonstrated no significant difference in accuracy for identifying these fractures (p=.38).Conclusions: While the limited sample size and number of readers did not allow the investigators to draw statistically significant conclusions, the relative accuracy of MFXI’s was comparable to POCUS, while the interrater reliability was greater for identifying small fractures in samples read by non-radiologist EM physicians suggesting that MFXI may have a place in the bedside POC diagnostic armamentarium in the future: further investigation is clearly warranted.

Keywords
ultrasound, Micro Focus X-ray Imaging, fractures
Comparing the Accuracy of Micro-Focus X-ray to Standard Ultrasound for Locating Glass Foreign Bodies

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Background: Foreign bodies (FB) are found in as many at 15% of traumatic wounds, with up to 38% initially missed leading to: infection, delayed wound healing, and loss of function. Radiopaque objects are easier to detect than radiolucent objects. Point of Care Ultrasound (POCUS) is now considered a reliable examination to detect FB in wounds; unfortunately, objects smaller than 2.5 mm maybe missed. Micro Focus X-ray Imaging (MFXI) has a 100-fold increased resolution as compared to conventional X-ray. This study compared the accuracy of MFXI and POCUS for the detection of small radiolucent glass foreign bodies. Methods: Six to seven small glass fragments (<1 mm to 2 mm) were embedded in five chicken wings and thighs. Two control samples were prepared with no FB to confirm reliability. Two Emergency Medicine physicians with US training imaged the chicken pieces with a linear-array (15–4 MHz) transducer using a uSmart® Terason 3200T US (Burlington, MA). Location and number of FB in each piece of chicken were recorded. The chicken pieces were then imaged with a True Focus X-ray tube, model TFX-3110EW (Tungsten anode and a 10 μm; μm focus) operated at 80 kV anode voltage. The chicken was placed 1.2 m below a 12-bit remote RadEye 200 CMOS detector with 100 &μ;m spatial resolution in a vertical imaging arrangement with a 1.6 m source to detector distance. The two physicians, blinded to the chicken pieces, counted the number of FB in each X-ray image. Results: Physicians identified 91/102 FB’s using micro focus X-ray (89% accuracy; 96% interrater reliability) and 70/102 FB’s using POCUS (69% accuracy; 13% interrater reliability). Interrater reliability was calculated to estimate the level of agreement between raters. Accuracy rates were compared between raters while adjusting for clustering by rater (p-values reflect adjusted comparisons). Conclusions: The small sample size and the small number of readers did not allow the investigators to draw statistically significant conclusions about the imaging modalities, however, the relative accuracy and inter-rater reliability of MFXI as compared to POCUS in identifying small FB in tissue sample as read by non-radiologist EM physicians was impressive. These findings strongly suggest that MFXI, which is being developed for bedside POC use in Emergency Medicine has great promise: further investigation is clearly warranted.

Keywords
ultrasound, Micro Focus X-ray Imaging, foreign bodies
Core Content for Pediatric Emergency Medicine Ultrasound Fellowship Training: A Modified Delphi Consensus Study

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Background: Pediatric emergency medicine (PEM) point-of-care ultrasound (POCUS) fellowships exist to ensure expertise in ultrasound education, administration and research oversight. Currently, there are no standardized goals or objectives for these programs, resulting in considerable variability in PEM POCUS fellowship training. Methods: A modified Delphi survey of PEM and general EM POCUS experts in Canada and the United States (US) was conducted to obtain consensus regarding the most important curricular components of a PEM POCUS fellowship training program. Participants were solicited from the P2 Network (www.p2network.com) mailing list and from PEM and EM POCUS fellowship directors listed on the Society of Clinical Ultrasound Fellowships and Canadian Society of POCUS-EM Fellowships websites. Curricular components considered as part of the survey included ultrasound skills, educational skills, administrative skills and research requirements. Participants were asked to rate the importance of each curricular component on a scale of 1-5. Consensus was considered to have been reached when ≥80% of respondents agreed to either include or exclude the component in fellowship training. Results: Round one of the survey was sent to 314 participants. 118 (37.6%) completed eligibility for the survey, and 92 of those (78.0%) met eligibility criteria. Eighty (67.8% of eligible participants) completed the first round of the survey. Round 2 of the survey was sent to those that completed part one, and 64 (80.0%) completed that round. During round one, consensus was achieved for 16 of 76 ultrasound skills, 7 of 7 educational skills, 9 of 11 administrative skills and 4 of 6 research requirements. In round 2 of the survey, consensus was reached on 2 additional ultrasound skills, but no additional administrative skills or research requirements. Conclusions: Using a consensus building process, the core content for PEM POCUS fellowship training was defined for ultrasound skills, educational skills, ultrasound program administration skills and research requirements. This can help POCUS educators formulate standardized curricula to create consistent training in POCUS fellowship graduates. Background: Opioid overdose has become a pandemic across the United States with emergency department (ED) visits for overdose being reported as having increased by nearly 30% from 2016-2017 (CDC MMWR, 2019).
March 9, 2018). It is critical to identify specific risk factors and population targets to develop effective support systems, particularly for patients presenting for repeat overdoses.

Objective: Determine the prevalence of opioid overdose presenting to the ED and identify risk factors associated with repeat overdose.

Methods: This retrospective cohort trial was performed at the ED of a rural, level 1 trauma center in the Southeast United States. Charts were reviewed of patients between the ages of 18 and 80 identified as presenting with an overdose (based on chief complaint or ED diagnosis) from January 2014 to December 2017. Demographic information was extracted along with intoxicant type, treatments provided in the pre-hospital or ED setting, and number of prior visits for overdose. Associations between previous visits and demographic/historical factors were evaluated using chi-square analysis with p<0.05 indicating significance.

Results: 516 charts were reviewed with 432 confirmed as having overdose. 45% of these patients represented first time visits. 55% of patients had at least one prior visit to the emergency department for overdose, with number of visits ranging from 1-8. Repeat visit for overdose was associated with a past medical history of opiate abuse (p<.001) and receiving Narcan at the time of presenting overdose (p<.001). Patients with medical insurance, regardless of insurance type, were less likely to have had a previous visit (p=.01). Patients admitted for overdose were also less likely to have had a prior visit for overdose (p<0.01). There was no association between previous visits for overdose and age, gender, race, ethnicity, or home medications.

Conclusion: While nearly half of the overdoses seen in the ED were first time events, recidivism for overdose is associated with a history of opiate abuse and the administration of Narcan at the presenting visit. This suggests that a population may need targeted intervention to decrease the incidence of subsequent overdose and that it would be particularly beneficial to identify those with a history of opiate abuse to receive such targeted intervention.

Keywords
Point-of-care ultrasound, education, fellowship, pediatric emergency medicine, Delphi, survey, curriculum
Background: The ACGME requires graduates of EM residencies to attain competency in the core applications of emergency ultrasound (US) by performing 150 scans. ACEP, CORD and SAEM suggest image acquisition and interpretation accuracy be assessed via expert image review of logged resident scans. Little is known about skill retention over time once these milestones are met. The objective of this study was to determine whether EM residents’ performance in acquiring and interpreting US changes throughout the course of training.

Methods: This was a retrospective observational study of resident-performed point-of-care US at the Harvard Affiliated Emergency Medicine Residency (HAEMR) between 2012 and 2018. PGY-1 residents rotated for 4 weeks with the EM US Division. Subsequently their scans over 4 years were reviewed and logged. The rate of inadequate exams (Technically Limited Study, or “TLS”), and residents’ accuracy in interpreting scans served as primary endpoints. Resident performance was evaluated as an aggregate per PGY using chi-square analysis.

Results: During the observed time, 131 EM residents performed 50,543 ultrasounds. The mean number of scans per resident was 192 (PGY-1), 149 (PGY-2), 149 (PGY-3) and 115 (PGY-4). Cardiac (41.6%), thoracic (20.7%), FAST (12.5%), renal (5.2%), and pelvic (4.0%) were the most common applications. A chi-square test of independence was performed to examine the relationship between PGY and both TLS rate and accuracy. The TLS rate significantly increased as residents progressed through residency (5.8% as PGY-1, 8.7% as PGY-2, 12.9% as PGY-3 and 14.4% as PGY-4, p<0.05). Accuracy of interpretable (non-TLS) exams over all residents was quite high (97.5%) but dropped significantly over the 4 years (98.3% as PGY-1, 97.1% as PGY-2, 96.6% as PGY-3, and 96.8% as PGY-4, p<0.05). Conclusion: A review of ultrasounds performed by EM residents at a single residency program showed an indirect correlation between PGY and accuracy of US interpretation and acquisition of interpretable exams. Despite having reached competency milestones as defined by ACGME by the end of PGY-1 there existed a significant degradation in acquisition and interpretation skills over the next three years. This study suggests that it should not be presumed that residents maintain a high level of quality as they progress through residency.

Keywords
point-of-care ultrasound, medical education, residency education
Correlation of Carotid Blood Flow and Inferior Vena Cava Collapsibility Index With Stroke Voume

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Background: Point of care ultrasound (POCUS) can provide non-invasive measurements of stroke volume (SV), which may help identify volume responsiveness in the emergency department. A significant component of the SV is delivered to the carotid arteries with each cardiac cycle. There are a few recent studies that have attempted to correlate various carotid Doppler calculations with invasive cardiac output measurements to identify volume responsiveness with mixed results. The aim of this study was to evaluate three non-invasive measurements and how they correlate with non-invasive echocardiographic measurements of SV. Methods: This was an observational study conducted over a 2-year period. Patients presenting to the emergency department who were to receive at least a 500 mL fluid bolus during their regular clinical care were eligible for inclusion. All measurements were performed based on published methods and standardized protocol. All ultrasound measurements were performed by one of six emergency ultrasound trained investigators. Three non-invasive measures—corrected carotid flow time (CCFT), carotid blood flow (CBF), and inferior vena cava collapsibility index (IVCCI)—and their correlations with estimated stroke volume were measured pre and post fluid bolus. Left ventricular outflow tract velocity time integral (LVOT VTI) was used to estimated stroke volume. Pre and post fluid bolus measurements were compared using a paired t-test. A multiple regression model was used to evaluate the combined change in CBF, CCFT, and IVCCI versus SV. Results: After excluding patients with incomplete data, 44 subjects were included. The combined change in CBF, CCFT, and IVCCI demonstrated statistically significant correlations with the change in stroke volume (r = 0.5, p = 0.003). Stroke volume variation in emergency room patients was reliably estimated alone by both the carotid blood flow (p = 0.004) and the inferior vena cava collapsibility index (p=0.01). Conclusion: Our data demonstrates that combined change in CCFT, IV index, and CBF demonstrated a statistically significant correlation with the change in stroke volume. CBF may be a better marker of stroke volume and less subject to measurements issues than CCFT.

Keywords
Ultrasound, resuscitation
Background
Summative evaluation of medical students in their clinical rotations varies widely among institutions. This is particularly important in emergency medicine (EM) where students applying for residency rotate at multiple sites. Despite the nearly universal reliance on summative evaluation tools, there is currently no consensus or “best practice” for these forms. Schools use unique forms, which may be based on different assessment paradigms, including ACGME competencies, Entrustable Professional Activities (EPAs), Milestones, or home grown global performance measures. Objectives
To describe and characterize end-of-rotation evaluation forms used by U.S. based medical schools for EM rotations.

Methods
A convenience sample of end of rotation forms was collected from the cohort of students applying for a 2018-9 visiting rotation at the University of Arizona. Additional forms were solicited from EM rotation coordinators and directors. Qualitative and quantitative analysis of 45 variables, including the theme of the form (ACGME, EPA, Milestones, “classic”, etc) was performed. Data was abstracted by two independent raters and consensus attained through group discussion. Results
A total of 68 evaluation tools were analyzed. Forms were categorized as ACGME-themed (45.5%), “classic” (5.9%), institution-specific (41.2%), and unable to categorize (7.4%). No forms used EPAs, Milestones or SLOE based themes. 48.5% referenced the Medical School Performance Evaluation (MSPE) or “Dean’s Letter.” There were categorical scales on 96% of forms, assessing students' global performance, and on a range of 1-31 discrete measures. Rating scales ranged from 2-12 levels of performance; 84% had anchors, and 44% referenced specific actions. All forms allowed for free text comments. 91.2% assigned cumulative grades. Conclusions
End-of-rotation evaluation forms vary widely in format and content. None of the forms analyzed used EPAs or EM specific assessment paradigms like Milestones, or SLOEs. Further research is needed to assess the utility of current evaluation tools and to establish evidence-based methods for effective clinical performance assessments both within the field of Emergency Medicine and across all specialties.

Keywords
Clinical Assessment Tools, Education, End-of-Rotation Evaluation Tools, Emergency Medicine Clerkship
Cyberattacks Against a Free Open Access Medical Education Resource

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Background: Free Open Access Medical Education (FOAMed) websites are an integral part of continuing education for learners at many different points in their careers. However, open access and increasing visibility on the internet also can bring undesired traffic in the form of cyberattacks. We sought to characterize the attacks that an established FOAMed resource may face by analyzing the types of attacks that have been deployed against an ECG tutorial website used by learners in emergency medicine. We hypothesized that the most frequent type of attack would take the form of code injection, in which malicious code is entered into forms (such as logins or comments).

Methods: This was a retrospective study of cyber-attacks against a popular FOAMed website. Anonymous session logs are collected by the website automatically for curriculum development and quality improvement. These session logs also provide a record of potential cyberattacks. Session logs were reviewed by algorithms that identified common attacks from public databases of malicious code, with ambiguous cases reviewed by consensus by three board-certified clinical informaticists. For security reasons, the name of the site and exact numbers of attacks have been withheld.

Results: From 2001-2017, the vast majority of independent user sessions were deemed to be valid users, with <1% being identified as unambiguous cyberattacks. The most common attacks were SQL Code Injection (50%) (Injection of database management code to attack the site’s records), Cross-Site Scripting (20%) (Injection of browser code to attack users of the website), and Shell Injection (21%) (Injection of commands to attack the site’s server).

Conclusions: Cyberattacks are an underappreciated threat to FOAMed resources. While comprehensively addressing potential vectors of cyberattack may be beyond the training of most authors of online medical education content, the volume and pervasiveness of these attacks highlight the importance of engaging collaborators who have specific training in clinical informatics and web-security.

Keywords
informaticscybersercurityFree Open Access Medical EducationFOAM
Defining a Necessary ED Visit for Alcohol Intoxicated Patients

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Background Many emergency department (ED) visits for alcohol intoxication are uncomplicated, resulting in a discharge without significant medical intervention. Our objective was to systematically define a necessary ED visit (NEDV) for an intoxicated patient from an expert panel and then use these criteria to estimate rates of the defined NEDV.

Methods We recruited an expert panel from The National Sobering Collaborative, a national society and conference on alternative care models for alcohol intoxication. Nine experts who were involved in the management of intoxicated patients were contacted to participate. A Delphi process involving two online surveys was used to build consensus on defining a NEDV for intoxication. The surveys had yes-or-no, multiple choice, and free response questions that posed hypothetical scenarios of patient presentations and asked whether the patient required treatment in a hospital. The second survey was used to clarify any inconsistency from the first survey. A retrospective chart review was then performed to evaluate rates of NEDV defined by the results of the expert panel. Subjects were patients arriving by EMS with an initial impression of alcohol intoxication.

Results Five out of the nine experts contacted participated in the Delphi process, which comprised of three EM boarded certified physicians, one emergency medical technician, and one sobering center director. Four definitions of a NEDV, expanding upon each other, were generated from the Delphi panel. Admission only definition: NEDV if admitted. Hard definition: if admitted, received consult, or received procedure. Medium definition: any components of the hard definition or received imaging. Soft definition: any components of the medium definition or received lab tests. Five hundred and five charts of ED visits between 3/29/15 to 12/31/15 were reviewed. Rates of a NEDV were: 8.3% by the admission only definition, 13.5% by the hard definition, 33.7% by the medium definition, and 42.4% by the soft definition.

Conclusion Consensus on a unitary NEDV was difficult to achieve. Due to this, we chose to examine multiple definitions derived from the Delphi Method to define a NEDV for alcohol intoxication. In doing so, we found rates of NEDV ranging from 8% to 42%. These rates are lower to comparable studies that evaluated final diagnoses as opposed to initial impressions of alcohol intoxication.

Keywords
Alcohol Intoxication Necessary ED visit Delphi Method Retrospective Chart Review
Design and Implementation of a Low-cost Partial-task Trainer for Gross Hematuria Management

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Background: Patients with gross hematuria, including clot-induced urinary retention, frequently present to the Emergency Department for management. These patients often require either manual clot irrigation (CI) or continuous bladder irrigation (CBI). However, many emergency medicine (EM) physicians are uncomfortable performing these procedures. This can result in unnecessary consultations and delays in care. Our objective was to design and implement a low-cost, realistic partial task trainer for teaching manual CI and CBI.

Methods: Our trainer was designed using inexpensive and readily available materials. A simulated bladder was made by cutting the administration port off of a 500cc bag of normal saline and emptying the contents. A Foley catheter (2-way for CI and 3-way for CBI) was placed into the bag and the balloon was inflated. A watertight seal around the bag was made using glue. To simulate hematuria and clots, red gelatin was mixed with saline and injected into the bag. The task trainer was used as part of an educational session for EM trainees. After a brief demonstration of both CI and CBI, trainees participated in hands-on practice. The trainees were asked to complete a brief, post-session, anonymous survey.

Results: 20 EM residents participated in the session (7 PGY-1, 7 PGY-2, 3 PGY-3, 4 PGY-4). Prior to this session, only 20% of participants had performed manual CI. On average, participant confidence performing CI rose from 1.6 before the session to 4.0 (p<0.001) after the session on a 5-point Likert scale (1=not at all comfortable, 5=extremely comfortable). Participants reported that the task trainer was quite useful as an educational tool, providing a rating of 4.3 (1=not at all useful, 5=extremely useful).

Conclusions: We successfully designed and implemented a low-cost partial task trainer for teaching gross hematuria management techniques. Using the trainer, we were able to significantly increase EM residents’ confidence performing these procedures.

Keywords
Simulation, Education, Urology
Design and Implementation of an ED Procedure Teaching Cart

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Background: Medical simulation has become a widely accepted method for teaching procedural skills. However, procedural task trainers, sample procedure kits, and other educational materials are rarely accessible in the clinical environment. Currently, providers will often open new, expensive kits to review the equipment or to teach a procedure to a junior learning prior to performing it on a patient. This can be a costly and inefficient practice. Our objective was to create an inter-disciplinary and inter-professional emergency department (ED) procedure teaching cart in order to provide clinicians and learners of all levels with an opportunity learn, review, or practice procedures during free time, impromptu teaching sessions, or just prior to performing the actual procedure on a patient.

Methods: After gaining support from ED leadership, we began to create a list of equipment and procedures we wanted to include. In addition to equipment for commonly taught or performed procedures, we also sought to include equipment that was complicated or commonly misused. In order to maintain the equipment in a safe and secure environment we procured a cart with a combination lock. To ensure patient safety, the cart, as well as each individual kit, was marked with labels that indicated “Not for Human Use-Educational Only.”

Results: We were able to successfully design, stock, and implement an ED procedure teaching cart. The cart currently contains a wide range of equipment including supplies airway management, surgical airways, central venous lines, arterial lines, lumbar punctures, paracentesis, thoracentesis, peripheral intravenous lines, epistaxis management, nasogastric tubes, incision and drainage, wound closure, nerve blocks, intraosseous access, tube thoracostomy and phlebotomy.

Conclusions: Using an inter-disciplinary and inter-professional approach, we were able to create an ED procedure teaching cart. This cart will allow providers not only to review and/or learn procedures, but also to familiarize or re-familiarize themselves with procedural equipment before they perform a procedure on a patient. We believe that this cart will lead to decreased costs from opening fresh procedure kits or contaminating equipment due to poor familiarity. More importantly, we believe that this cart will lead to improved provider education and increased patient safety.

Keywords
Education, Simulation, Procedure
Developing a Decision Aid to Facilitate Shared Decision Making Regarding CT Imaging for Kidney Stones

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Background: Every year approximately 2 million patients are seen in US EDs for suspected renal colic, and the majority receive a CT scan. Because of recent evidence demonstrating equivalent clinical outcomes between CT and ultrasound, emergency physicians have noted that this to be an appropriate clinical scenario for the use of shared decision-making (SDM). The objective of our study was to develop a stakeholder-informed conversation aid to help clinicians use SDM in the context of the decision regarding CT scanning in patients with suspected renal colic. Methods: Using a published decision aid development framework (Coulter et al), and under the direction of a multi-disciplinary Steering Committee, we engaged a diverse set of stakeholders via qualitative methods. EM clinicians (attendings, residents, and advanced practitioners), urologists, radiologists, researchers, and emergency department patients participated in focus groups and semi-structured interviews. All groups were recorded, transcribed, and analyzed in an iterative process by a four-person coding team. Emergent themes were identified, discussed, and organized. A decision aid prototype was developed and iteratively refined. Results: A total of 8 interviews and 7 focus groups were conducted with 36 stakeholders (local ED patients and clinicians, and clinicians and researchers from diverse regions of the US and Canada). The following four themes emerged: 1. Patient participants consistently reported a desire to be involved in this decision and wanted more information about radiation exposure, cost, and how the CT scan would change the plan of care. 2. Clinicians were comfortable diagnosing kidney stones without a CT scan, however, some were hesitant and felt that clinical uncertainty was a barrier to SDM. 3. Clinicians, researchers, and patients all identified strategies to facilitate this conversation such as check-lists and visual aids. 4. Both patients and clinicians felt that a “nudge” would be an acceptable aspect of a conversation aid. Based on this multidisciplinary input, a prototype was developed and refined. Conclusion: Using stakeholder input, we developed a communication tool to facilitate an SDM conversation around the use of CT in suspected renal colic. Further testing will assess whether this tool can safely improve patient engagement and decrease low yield CT usage.

Keywords
Shared Decision Making (SDM), kidney stone, nephrolithiasis, CT Scan, CAT scan, renal colic

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Development and Validation of a Predictive Model for ED Wait Times

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Background: Time from ED arrival to evaluation by a medical provider is a key ED metric with important implications for patient satisfaction, health outcomes, and clinical operations. Understanding of the factors influencing wait time in the ED may be useful in identifying the interventions mostly likely to decrease waiting times successfully. The objectives of this research were to: 1) identify cross-sectional and temporal patterns in wait times, and 2) to create a model accurately predicting wait times in the study ED.

Methods: Data elements were electronically extracted from electronic health records (EHRs) for ED encounters over 5 years (2013–2017) at our academic Level I trauma center (N=327,275). We identified key elements for analysis with known or suspected wait time associations (day of week, month, lunar cycle, arrival time, first evaluation time, disposition decision time, departure time, disposition category, patient age, presenting ESI (Emergency Severity Index) category, chief complaint, ED census and waiting room volume). Data were cleaned of encounters with missing or nonsensical data elements (6%) and were divided into training and validation sets. Several modeling approaches were used: exponential smoothing, ETS (error, trend, seasonality), ARIMA (Autoregressive Integrated Moving Average; with and without external regressors), and TBATS. Cross-validation with data from a 1-year period withheld from the original training set assessed single and ensemble model performance.

Results: An ensemble model of the ETS, TBATS, and ARIMA forecasts performed best in these analyses. Mean wait time for arriving patients was significantly correlated to several factors considered, particularly to presenting ESI as well as the numbers of discharged and admitted patients present in the ED at the time of arrival. For every patient designated as an admission or discharge in the ED at the time of arrival, an additional wait time of 1.5 minutes (±0.0157), on average, is added to the predicted wait-time based on ESI designation.

Conclusions: There are a multitude of factors likely to impact the wait-times of patients presenting to an ED. By capitalizing on the widespread use of EHRs, operational decisions can be informed by analysis of data for individual institutions. Future research prospectively validating the model created here is warranted.

Keywords  
emergency department, emergency department throughput, emergency department flow, predictive modeling
Does the Physician Matter? Identifying Predictors of Admission from the Emergency Department for Medicare Patients

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Background: Rates of admission from the ED vary widely across regions and institutions. Though the decision to admit a patient is made by emergency physicians (EPs), little is known about the extent to which the decisions of individual EPs contribute to variation in admission rates. Objective: We sought to quantify the extent to which individual physicians contribute to observed variation in rates of admission from the ED. Methods: Using a 20% random sample of elderly Medicare fee-for-service enrollees from 2012-2014, we estimated mixed-effect linear regression models that included patient, physician, hospital, and area level predictors to estimate the extent of variation in admission rates that could be attributed to each level after accounting for patient-level covariates. We restricted our sample to medical diagnoses with at least 30,000 visits over the time period treated by EPs who saw at least 5 cases within EDs including at least 5 EPs. Results: We studied 4,607,886 visits seen by 43,173 unique EPs at 3,425 EDs. The mean age of patients was 72.5. Patients were predominantly female (58.6%) and white (80.1%). The majority of physicians were male (75.6%) and most were trained in emergency medicine (EM, 68.8%). In adjusted models, there was considerable variation across physicians in rates of admissions – the probability of admission changed by 13.3% (95% CI 13.2% - 13.4%) if a patient visited a physician at the 90th versus the 10th percentile of admission propensity. After adjusting for patient level variation, we found that physician, hospital, and area levels accounted for 13.3%, 64.3%, and 22.4% of the remaining variation, respectively. Conclusions: There are substantial differences in the likelihood of admission across EPs. There is substantial unexplained variation at the hospital level, though some of this may be attributable to unmeasured variation at the physician or patient level. Interventions targeted at EPs within high admission rate hospitals could have a significant impact on overall variation.

Keywords
emergency departmentMedicarepredictors of admission
Dosage and Effects of 2,4-Dinitrophenol for Weight Loss As Described on Social Media.

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Background: 2,4-Dinitrophenol (DNP) is a re-emerging weight loss supplement that increases metabolism by uncoupling oxidative phosphorylation. Removed from the market in 1938 after multiple fatalities, DNP fatalities in adolescent and young adult males have been increasing since 2003. DNP is discussed on social media as more effective for weight loss than diet or stimulants. The goal of this study is to analyze social media to identify the doses, patterns of use, and co-ingestants described with DNP use. Methods: We used our previously published and validated computational methods to search online forums for discussions on DNP or synonyms and extract mentions of doses, effects, and other substances. We calculated the frequency with which substances were mentioned and the correlation between patterns of mentions of substances. We tabulated the effects associated with each mentioned dose of DNP. We assessed the statistical significance of the correlation using bootstrapping with a Benjamini-Hochberg correction for multiple comparisons, with a false discovery rate of 0.05. Results: We extracted a total of 1,486 unique posts from 661 discussion threads across 5 bulletin board forums from 2015-2018 that mentioned DNP or related keywords. The doses discussed ranged between 275 ± 100 mg daily, expressed as median ± interquartile range. At doses below 300 mg daily the most commonly reported unintended effects were sweating, difficulty sleeping due to sweating, fatigue preventing exercise, and yellowish discoloration of body fluids. At doses greater than 300 mg daily the most commonly reported unintended effects were rash, blurry vision, fatigue preventing any activity, and profound diaphoresis. The top five substances significantly co-mentioned with DNP were loratadine (p=0.033), cetirizine (p=0.04), quercetin (a polyphenol proposed to be an antioxidant, p=0.04), zinc (p=0.04), and 17 alpha-Methyl-19-nortestosterone (a progestin, p=0.04). P-values are shown after Benjamini-Hochberg correction. Conclusion: Social media can provide valuable insight into the patterns of use of unregulated substances, including doses and co-ingestants. The patterns here agree with reported case studies but extend surveillance to a larger population, including those without toxic ingestions.

Keywords  
pediatrics, toxicology
ED Electrical Cardioversion: Shockingly Simple and Safe

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Background: Electrical cardioversion of ED patients is a well-described treatment strategy for those presenting within 48 hours of atrial fibrillation (AF) onset (non-anticoagulated) or longer if anticoagulated. The objective of this study was to describe the safety and outcomes of this practice in a cohort of patients undergoing ED electrical cardioversion for atrial fibrillation. Methods: This retrospective health records survey investigated a 8-year cohort of consecutive ED patients presenting with AF who underwent electrical cardioversion in an academic, tertiary ED. Electronic and manual abstraction strategies were used, extracting data on demographics, clinical features, interventions, complications, and return visits within 1 month. Data were analyzed using descriptive statistics and agreement between trained abstractors on key variables was excellent (k=0.94-0.98). Results: Data from 888 patients were analyzed (median age 61 years; range 14 to 95; 597 (67%) male). Mean AF duration was 3.4 hours (SD 1.9, 95% CI: 3.2-3.5) in non-anticoagulated patients, and 4.0 hours in anticoagulated patients (SD 1.9, 95% CI: 3.8-4.3). Electrical cardioversion was successful in 781 (88%) encounters. There were 3 major complications (3/888; 0.3%) and 123 minor complications (123/888; 14%). 85 (68%) were attributed to procedural sedation while 41 (33%) were attributed to electrical cardioversion. Those attributed to cardioversion were generally transient and mild (n=40); however, one post-cardioversion stroke was documented (1/888; 0.1%). 22 patients (2.5%) experienced brief peri-procedure desaturation (<85%) with 1 (0.1%) requiring a jaw thrust maneuver. 59 (6.7%) experienced peri-procedure hypotension; 1 (0.1%) was observed overnight in our clinical decision unit (management change). 741 patients (84%) were discharged following electrical cardioversion with a mean ED LOS of 218 minutes (SD 152, 95% CI: 206-231 min). 57 (6.4%) patients returned to the ED within 30 days; 43 (4.8%) returned with relapse of atrial fibrillation or flutter. Conclusion: In this cohort of ED patients with atrial fibrillation, ED electrical cardioversion followed by discharge to home was largely safe and effective. Most complications were transient, mild, and attributable to procedural sedation. Serious complications attributable to cardioversion were very few.

Keywords
atrial fibrillation, emergency medicine, electrical cardioversion, emergency department
Effectiveness of Children’s Disaster Risk Reduction (DRR) Program on Earthquake Preparedness in Jordan

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Background: Children represent a particularly vulnerable population in disasters. Disaster Risk Reduction refers to a systematic approach to identifying, assessing and reducing risks of disaster through sets of interventions towards disaster causes and population vulnerabilities. Disaster Risk Reduction through the education of the population, and especially children, is an emerging field requiring further study. Methods: An educational program on Disaster Risk Reduction can induce sustained improvement in knowledge, risk perception, awareness, and attitudes toward preparedness behavior of children. A Disaster Risk Reduction educational program for students aged 10-12 was completed in an earthquake prone region of Jordan (Madaba). Subject students (A) and control groups of similarly aged untrained children in public (B) and private (C) schools were surveyed 1 year after the program. Surveys focused on disaster knowledge, risk perception, awareness and preparedness behavior. Likert scales were used for some questions and binary yes/no for others. Results were collated and total scores averaged for each section. Average scores were compared between groups and analyzed using SPSS. Results: Students who had completed the Disaster Risk Reduction program were found through Levene’s test to have statistically significant improvement in earthquake knowledge (5.921 vs 4.55 vs 5.125 ), enhanced risk perception (3.966 vs 3.580 vs 3.789), improved awareness of earthquakes (4.652 vs 3.293 vs 4.060) with heightened attitudes toward preparedness behavior (8.008 vs 6.517 vs 7.597) when compared to untrained public and private school control groups respectively. Conclusions: Disaster Risk Reduction education programs can have lasting impacts when applied to children. They can improve student’s knowledge, risk perception, awareness, and attitudes towards preparedness. Further work is required to determine frequency of re-education required and appropriate age groups for educational interventions.

Keywords
Education Disaster Resilience Earthquake preparedness Childrens disaster preparedness Paediatric preparedness

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Efficacy of Computed Tomography Use in Assessing Traumatic Brain Injury in Adult and Pediatric Patients

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Background Computed tomography (CT) is ordered to assess for traumatic brain injury (TBI) in the emergency department with varying efficacy. Using an internally developed RADiology report CATegorization system (RADCAT), we evaluated the efficacy of head CT utilization in the assessment of TBI across adult and pediatric emergency department (ED) patients within a single healthcare system. Methods At a Level 1 Trauma Center with an annual census of 170,000 we performed a retrospective chart review of all patients who received a head CT to assess TBI between 11/1/2017 – 2/22/2018. Head injury patients who did not have CT imaging were excluded. All diagnostic radiology reports are categorized using the RADCAT system. RADCAT uses a 5-point scale to score acuity of CT findings. Scores ≤ 3 are normal or routine. Scores ≥ 4 are high priority and include all acute findings such as acute traumatic subdural hematoma, subarachnoid hemorrhage, intracerebral hemorrhage, or skull fracture. The efficacy of CT use to assess TBI was compared across the adult and pediatric emergency departments. Results During the study period 5,341 head CT’s were obtained for TBI and 992 (18.5%) were identified to contain positive/high priority findings. A total of 250 CT scans were obtained in the pediatric ED (4.7% of the total number of scans). High priority results were identified in 77 (30.8%) of these studies. Within the adult ED population, 5,091 non-contrast head CT’s were completed and 915 (18.0 %) contained positive/high priority results. CT scans ordered in the pediatric ED more frequently identified pathology than in those ordered in the adult ED. Conclusion The pediatric population had a higher rate of high priority results among those undergoing non-contrast head CT for TBI compared to adult patients. Future research will aim to further understand the increased accuracy of CT utilization in the pediatric population.

Keywords
Traumatic brain injury, Computed tomography, pediatric, RADCAT
Electronic Medical Record Phenotyping Accurately Identifies Opioid Use Disorder in the Emergency Department

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Background
Emergency departments are increasingly the primary location for healthcare services by individuals at risk or suffering from opioid use disorder (OUD). Electronic medical record (EMR) phenotyping, defined as computerized querying of heterogeneous records, supports the measurement and comparison of interventions capable of increasing the adoption of emergency department-initiated medication for OUD.

Methods
A computable phenotype to identify patients with OUD was developed and evaluated using structured clinical data. Two algorithms were developed: algorithm 1 combined clinician and billing codes, while algorithm 2 used string and character matching to extract data from chief complaints. To evaluate the algorithms, two emergency medicine residents with a third acting as adjudicator reviewed a pragmatic sample of 100 charts meeting at least one algorithm criterion, and assessed for presence of OUD as defined by Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) criteria.

Results
Agreement between reviewers was high (Cohen’s kappa of 0.95). Algorithm 1 had a Positive Predictive Value (PPV) of 0.96 and Negative Predictive Value (NPV) of 0.98, while for algorithm 2 both values were 1.0. The most frequently met DSM-5 criteria were opioids taken in larger than intended amounts or opioid use in physically hazardous situations, while the least frequent criteria were those describing social dysfunction related to the use of opioids.

Conclusion
This computable phenotype was created for an upcoming pragmatic trial which aims to identify OUD patients eligible for an intervention with high specificity. This phenotype is capable of identifying OUD patients in the EHR, with high predictive value and reliability for the subsequent trial.

Keywords
opioid use disorder; clinical informatics; clinical phenotyping; electronic medical records
Elevated Renalase Levels In Patients w/ Acute Coronary Microvascular Dysfunction: Possible Biomarker For Ischemia

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Background: Recurrent chest pain in the absence of obstructive coronary arteries is common and coronary microvascular dysfunction (CMD) is the most common mechanism. We explored the relationship between inflammation, renalase an anti-inflammatory protein, and acute chest pain with coronary microvascular dysfunction (CMD).

Methods: We used cardiac Rb-82 PET/CT imaging to diagnose coronary artery disease (CAD/CALC) (defect or coronary calcification) and CMD (depressed coronary flow reserve without CAD) in patients with chest pain in an emergency department (ED). Blood samples were collected pre-imaging within 24 hours of ED presentation and were analyzed for renalase and inflammatory markers including C-reactive protein, interleukins, interferon gamma, tumor necrosis factor, vascular endothelial growth factor, and metalloproteinases. Exclusions were age ≤30 years, myocardial infarction, hemodynamic instability, hypertensive crisis, heart failure or dialysis.

Results: Between 6/2014-11/2015, 80 patients undergoing PET/CT provided blood and were categorized as normal (18%), CAD/CALC (27%) and CMD (55%). Median renalase values were highest in patients with CMD (5503 ng/ml; IQR 3070) compared to patients with normal flows (4266 ng/ml; IQR 1503; p = 0.02) or CAD/CALC (4069 ng/ml IQR 1850; p =0.004). CMD patients had similar median values for inflammatory markers as normal patients (p > 0.05). Renalase remained an independent predictor of CMD (OR 1.34; 95% CI= 1.1-1.7, per 1,000 ng/ml) after adjustment for smoking, family history, obesity and Framingham risk score. In a model for CMD diagnosis with Framingham risk score, typical angina history and CRP, renalase improved discrimination from C-statistic=0.60 (95% CI 0.47, 0.73) to 0.70 (95% CI, 0.59-0.82).

Conclusion: We found elevated renalase in response to ischemia from acute CMD. Its role as a biomarker needs validation in larger trials.

Keywords
coronary microvascular dysfunction, PET, chest pain, , renalase, biomarker, inflammation
Background: Acute pancreatitis is one of the most common gastrointestinal conditions leading to admission in US hospitals. There is an opportunity to reduce inpatient admissions with the use of ED observation units for patients with mild pancreatitis. The objective of this study was to determine if an ED observation-based pancreatitis pathway is feasible and would reduce inpatient admissions. Methods: This was a prospective pre- and post- interventional study conducted at a major tertiary care ED. Inclusion criteria: lipase >3X the upper limit of normal and/or an ED diagnosis of acute pancreatitis. Pre-intervention period was April 2015 – March 2016 and patients were treated per usual care. Post-intervention period was April 2016-March 2017 and providers were encouraged to utilize an ED observation-based pathway to manage patients with mild acute pancreatitis. The primary outcome was inpatient admission rate, and a 2 sample t-test was used to compare the rate among the two time periods. Secondary outcome was hospital length of stay; we used Wilcoxon rank sum to compare time periods. Results: There were 283 acute pancreatitis patients in the pre-intervention cohort and 250 in the post-intervention group. There were no major significant differences in demographics, comorbidities, or labs between groups conditions. Prior to pathway implementation, 272 (96%) patients with pancreatitis were admitted whereas after pathway implementation 213 (85%) were admitted with absolute reduction of 10.9% (95% CI 6.0-15.9%). No patient placed in observation subsequently required inpatient admission. Total hospital length of stay was similar between the two groups at 4.6 +/- 5.1 and 4.7 +/-6.2 days (p = 0.67). Interestingly, a total of 65/283 (23%) pre-pathway and 61/250 (24%) post pathway patients had a short length of stay ( Conclusions: The implementation of a pancreatitis pathway resulted in more patients, albeit modest, having their pancreatitis managed from the ED than prior to pathway deployment. None of the patients managed in ED observation required inpatient admission, suggesting ED management of mild acute pancreatitis is feasible. Further opportunity exists at our hospital to reduce inpatient admissions further.

Keywords
Pancreatitis, ED Observation
Emergency Medicine Physician Perspectives on Clinical Decision Support for Behavioral Health Risk Prediction

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Background: Many clinical decision support (CDS) tools that leverage big data analytics attain reasonable predictive power yet are underutilized in practice. Physician user experience (UX) testing is a crucial but little-studied element of CDS success. We explored ED provider UX of behavioral health predictive CDS. Methods: Semi-structured interviews, based on best practices for cognitive interviewing and UX testing, were conducted to thematic saturation with a purposive sample of EM attendings and residents at urban academic EDs in a single state. After asking about predictive analytics in general, interface design ergonomics were assessed using interactive CDS prototypes predicting hypothetical patients’ risk of opioid overdose and ED recidivism. Interviews were audio-recorded and transcribed verbatim. Transcripts were coded separately by two team members using an iteratively refined coding scheme until concordance was reached. Codes were entered into NVivo 12 software for pattern examination and interpreted using framework and thematic analysis techniques.

Results: Eleven ED physicians diverse in gender, experience and age group (ranging from residents to departmental leadership) were enrolled. Most were familiar with or had personally interacted with CDS technology. Concerns about predictive behavioral health CDS included trustworthiness, loss of physician agency, legal liability, devaluing the "art of medicine" and reimbursement. Potential barriers to use of behavioral health CDS included ED physician time limitations, lack of effective treatment options and difficulty facilitating linkages to outpatient services. Participants expressed discordant data visualization preferences in terms of notification design (e.g. location, color, content). Nearly all providers perceived CDS as potentially helpful for opioid overdose prevention; roughly half perceived utility for reducing ED recidivism. For both conditions, alerts that automated documentation, synthesized established risk factors and contained actionable recommendations were collectively preferred. Preferences did not vary according to age and experience level.

Conclusions: To increase utility and acceptability, behavioral health predictive CDS should incorporate common UX concerns and preferences. Future research will test real-time use of these programs.

Keywords
emergency medicine, bioinformatics, clinical decision support, opioid overdose, ED recidivism, workflow, user experience, behavioral health
Emergency Medicine Providers’ Knowledge, Attitudes, and Practices Regarding Overweight/Obesity

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Background: No prior studies have explored knowledge, attitudes, or practices related to overweight or obesity (OW/OB) among emergency medicine providers (EMPs), or whether EMPs might be eligible initiators of screening or referral for patients with OW/OB. We sought to explore each of these variables among EMPs. Methods: A survey was developed by incorporating questions from previously published studies and distributed electronically over a 3-week period to 127 attending physicians and advanced practice providers in community and academic emergency departments (EDs) affiliated with a large academic center in the Northeast. A raffle incentive was offered during the first two weeks. Results: Of 45 respondents (35%), most were male (67%), white (71%), attending physicians (76%), and mean age was 41 years (standard deviation=11.3); median practice duration was 11 years (interquartile range=6-20). The majority never received formal training in screening for or treatment of obesity (>77%). Using vignettes with BMI data, 71% and 78% correctly identified overweight and obesity, respectively. Nearly all agreed that obesity is associated with serious medical conditions (98%) and early treatment is important (91%). Most reported being somewhat or very likely to notice/assess BMI in their clinical practice (76%), though 58% reported they were not at all or only slightly likely to bring up weight when the patient had a weight-related medical problem. Providers expressed low self-confidence in their ability to help find resources for patients with OW/OB (69%). Most agreed that time constraints (58%) and lack of resources within (84%) and outside of the ED (60%) present challenges to addressing OW/OB. Most EMPs wanted to improve their counseling skills regarding weight (73%) and access to weight management resources to provide patients while in the ED (80%). Conclusions: Among this sample of EMPs, there is consensus that obesity is a serious medical condition and treatment is important, but lack of time, resources, and knowledge limit weight-related interventions in EDs. These findings suggest potential training opportunities for EMPs. More work is needed to better understand the patient experience.

Keywords
Obesity, Survey, Emergency Medicine Providers, Public Health
Emergency Medicine Research Associates Program: Impacts and Outcomes

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In 2014, the Emergency Department at Baystate Medical Center launched its newest internship program, called the Research Associate Program. This program aims to give undergraduate, graduate, gap year students, and volunteers a chance to learn about clinical research in a hospital setting by assisting principal investigators with the completion of pilot projects, surveys, and other research tasks. To recruit interested individuals, the program relies on word-of-mouth, career/internship fairs, and online interfaces via the different colleges. To date, we have had individuals from 10 colleges and universities. Over the past 4 years we have enrolled over 650 subjects across different studies, with a routine follow-up rate around 80%. We have been able to complete chart review studies as well as quality improvement projects. A more formal application process began in 2016. Between the years of 2014-2016, 22 individuals took part in the program with 16 completing the 1 year requirement. From 2016 to date, we have had 109 individual apply, with 43 being accepted, and 19 have completed the program, with 8 associates currently active. Many associates join our program with the intent of pursuing a career in healthcare, with some changing paths throughout. From the year 2014 to present, 12 of our associates have gone on to higher education in health care, with 6 going on to paid research positions. Our providers have completed projects that would not be able to be completed without the associates’ help. A reviewer for a recently submitted K-Award through the Agency for Healthcare Research and Quality noted that the department’s ability to enroll patients in a pilot study was an essential aspect of the application, demonstrating feasibility that would have been questionable otherwise. Overall, this program has helped our principal investigators complete projects they may not have otherwise completed with high follow-up and enrollment rates.

Keywords
research associates
Emergency Physician Observation Practices After Naloxone Resuscitation

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Background The number of patients transported to EDs after resuscitation with naloxone has risen rapidly during the opioid epidemic. Recommendations on appropriate observation periods vary dramatically across the EM and toxicology literature as the epidemiology of opioid toxicity changes, creating the potential for inconsistent practice among physicians and varying levels of risk to patients. We sought to characterize EM physicians’ approaches to the post-naloxone patient, the factors influencing their decision-making, and administrative policies and guidance they have received on the topic. Methods In this qualitative study, we recruited a geographically diverse sample of physician attendees at the ACEP Scientific Assembly in October 2018. We asked subjects whether they required patients to be observed after naloxone, the length of observation, the rationale for their practice, and whether their department provided standardized policies or education on the topic. Interviews were recorded, transcribed, and analyzed by 3 reviewers using a constant comparative method. Discrepancies in coding were reviewed and resolved by consensus. Results We interviewed 59 EM physicians representing all regions of the United States, including academic and community hospitals, in urban and rural settings. Most physicians reported no institutional guidelines for management (92%), nor formal education on the topic (90%). All physicians surveyed recommended some period of observation, but the duration was highly variable, ranging from 1 hour or less (8%), 2-4 hours (48%), to over 6 hours (17%). Physicians’ primary justification for their observation practice was direct experience (60%), with fewer relying on literature review (23%), or residency training (25%). A majority of physicians (92%) reported engaging in bargaining measures with patients (such as providing food) to encourage compliance with observation. Over half (56%) were concerned about potential legal repercussions from compelling observation. Conclusion EM physicians differ markedly in their practice of observation after naloxone, and have significant concerns about professional and legal risks from providing care. This research suggests that formal education and institutional guidelines are needed to reduce the heterogeneity of care for patients suffering from opioid overdoses.

Keywords opioid overdoses substance abuse ethics of care
Evaluating a Biosensor Device for Vital Sign Monitoring in Septic Emergency Department Patients in Rwanda

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Background: Low- and middle-income countries (LMICs) bear a disproportionately high burden of sepsis, contributing an estimated 90% of global sepsis-related deaths. Critical care capabilities needed for septic patients, such as continuous vital sign monitoring, are often unavailable in LMICs. This study aimed to assess the feasibility and accuracy of using a small wireless, wearable biosensor device linked to a smartphone and cloud analytics platform for continuous vital sign monitoring in emergency department (ED) patients with suspected sepsis in Rwanda.

Methods: This was a prospective observational study of adult and pediatric patients (≥ 2 months) with suspected sepsis presenting to the University Teaching Hospital of Kigali ED. Biosensor devices were applied to patients’ chest walls and continuously recorded vital signs (including heart rate and respiratory rate) for the duration of their ED course and compared to intermittent manually collected vital signs performed by a research nurse every 6-8 hours. Pearson’s correlation coefficients were calculated over the study population to determine the correlation between the vital signs obtained from the biosensor device and those manually collected.

Results: A total of 42 patients (20 adults, 22 children) were enrolled. Mean duration of monitoring with the biosensor device was 34.4 hours. Biosensor and manual vital signs were strongly correlated for heart rate (r=0.87, p<0.001) and respiratory rate (r=0.74, p<0.001). Feasibility issues occurred in 9/42 (21%) patients although were minor and included: biosensor falling off (4.8%), technical/connectivity problems (7.1%), removal by a physician (2.4%), removal for a procedure (2.4%), and patient/parent desire to remove the device (4.8%).

Conclusion: Wearable biosensor devices can be feasibly implemented and provide accurate continuous vital sign measurements in critically ill pediatric and adult patients with suspected sepsis in a resource-limited setting. Further prospective studies evaluating the impact of biosensor devices on improving clinical outcomes for septic patients are needed.

Keywords
sepsis, low- and middle-income countries, biosensor, Rwanda

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
Evaluating the Impact of Hospital Closure on Local Emergency Department Operations

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Background: Emergency department closure can complicate patients’ access to care and place clinical strain on the local health system. Less is known about the downstream effects on operational performance at remaining EDs. The objective of this study was to determine the impact of Memorial Hospital of Rhode Island’s (MHRI) closure on operational benchmarks at two neighboring EDs, compared to a geographically distant control. We also aimed to describe ambulance diversion in RI pre- and post-closure.

Methods: We performed an interrupted time-series analysis utilizing data obtained from the electronic health records of a large health system. We examined three hospitals within the same state: a 247-bed community facility 3 miles from MHRI (Hospital 1); a 719-bed academic Level 1 trauma center 7 miles away (Hospital 2); and a 129-bed community facility 40 miles away (Control). We compared a two-year pre-closure baseline period (11/30/2015-11/30/2017) with the first 11 months post-closure following a one-month washout period (1/1/2018-11/30/2018). We evaluated three ED operational metrics: monthly ED volume, length of stay (LOS), and left without being seen (LWBS) rates. We also describe patient demographic data and statewide ambulance diversion rates pre- and post-closure.

Results: In the first 11 months following MHRI closure, the average monthly ED volume at Hospital 1 increased by 14%. The ED LOS increased by 24% for discharged patients and 24% for admitted patients. The LWBS rate increased 123%. The average monthly time on diversion increased 374%. The share of patients from MHRI’s primary catchment increased 38%. Hospital 2 also experienced increases in LOS: 15% for discharged and 18% for admitted patients. LWBS increased by 76%. There was a -2% decrease in ED volume. The time on diversion increased by 60%. The control hospital experienced smaller changes in metrics: LOS (5% for discharged, 4% for admitted), LWBS (-2%), and volume (1%).

Conclusion: In the first year after a community hospital closure in RI, LOS, LWBS rates, and diversion time increased at two nearby hospitals, but not at a distant control, suggesting resultant operational strain at local EDs. Knowing the extent of operational demand that results from a hospital closure may aid planning in future hospital closure situations. Further resource investment is required to support this increased clinical demand.

Keywords
Hospital closure, ED operations
Evaluating the Usefulness of Urgent care in Improving Adherence to Population Health Quality Metrics

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Background: In an attempt to improve quality of care across a network patient population, specific quality measures have been identified and adopted by both Medicare-based shared savings programs and private insurers. As an increasing number of patients are being seen in episodic care settings such as urgent care centers or emergency rooms, we believe these locations provide additional opportunities to address population health initiatives (e.g. breast cancer screening and weight management). This project aims to show the quality benefits of screening and intervention for such population health quality metrics in an episodic care location.

Methods: Eligible patients (members of the Beth Israel Deaconess Care Organization [BIDCO]) were screened upon presentation through a population health look-up available on the Beth Israel portal, where they were asked standardized questions that assessed breast cancer screening and weight management during their visit to Chestnut Hill Urgent Care.

Results: There were 225 visits from BIDCO patients to our Chestnut Hill urgent care from January 2018 to April 2018. 11.4% (95% CI: 6.2-18.7) of female patient visits were overdue for a mammography and were provided with follow-up information for scheduling an appointment with radiology. 49.3% (42.6-56.1) of all patient visits did not have documentation of a calculated BMI in the past 6 months. Of these patients, 11.7% (6.4-19.2) refused further query and 19.8% (12.9-28.5) had a BMI > 29 and were given educational and follow-up materials concerning weight management.

Conclusions: As hypothesized, in our small trial we were able to show that a significant percentage of patients who are seen in the urgent care setting are not complaint with weight management and breast cancer screening. Our Urgent Care clinics provide a key point of screening and intervention for these patients and they would benefit from processes that include the urgent care space as one of the touch points for meeting population health quality benchmarks.

Keywords
preventative medicine, urgent care clinics, health screening
Evaluation of an Electronic Laboratory Results Notification Tool

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Background: Emergency Departments (EDs) measure throughput metrics for quality improvement. A predominant factor in those metrics is time awaiting patient results. Results for blood tests, imaging, etc, serve as a branch point in medical decision making. The time it takes for a test to result, the provider to acknowledge it, and the subsequent incorporation of the result into medical decision making are all critical. To streamline this process, one healthcare system in Massachusetts created a system allowing providers to opt-in to the automated notification of certain results via alphanumeric pages. Our study aimed to evaluate the impact of this notification system on the time between lab results and subsequent provider actions related to pulmonary embolisms. Methods: Administrative data were collected from the electronic medical record for all patients seen in the EDs of two academic hospitals in Boston, MA between 04/01/2016 and 03/31/2018. Encounters were selected based on the ordering of a d-dimer and chest imaging (CT or ventilation/perfusion scans). A two-sample t-test analyzed the time between a d-dimer result and subsequent pulmonary imaging among encounters in which the notification system was and was not activated. Results: There were 266,856 patient encounters in the EDs during the study period with 8,482 d-dimers results. The notification system was activated for 122 encounters. On average, during encounters in which automated notifications were sent, chest imaging was ordered 27.5 minutes after d-dimer result, while among encounters without automated notifications, imaging was ordered after 33.1 minutes. Maximum lag time was 159 minutes with automated notifications compared to 236 minutes without notifications. The difference in time to imaging ordering after d-dimer result was not statistically significant, t(1313) = 0.80, p = 0.42, 95%CI: -8.01 to 19.1. Conclusions: Though not producing a statistically significant difference in the time between d-dimer result and imaging for suspicion of pulmonary emboli, the automated notification system may be achieving its goal in other clinical scenarios. The fact that the maximum time to ordering was 67% shorter suggests that it may be making clinically significant differences despite statistical insignificance. Further investigation is warranted into the use and impact of this notification system.

Keywords
Clinical Operations, Clinical Decision Support, Quality Improvement
Evolution of United States legislation to facilitate bystander response to opioid overdose

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Background  
Opioid overdose deaths in the United States are increasing. Time to restoration of ventilation is critical. Rapid bystander administration of opioid antidote (naloxone) is an effective interim response but historically constrained by legal restrictions.  

Methods  
We sought to review and contextualize development of legislation facilitating layperson administration of naloxone across the United States. Publicly accessible databases (1,2) were searched for legislation relevant to naloxone administration between January 2001 and July 2017. Results  
All 51 jurisdictions implemented naloxone access laws between 2001 and 2017; 45 of these between 2012 and 2017. Nationwide mortality from opioid overdose increased from 3.3 per 100,000 population in 2001 to 13.3 in 2016. 38, 42 and 35 jurisdictions enacted laws giving prescribers immunity from criminal prosecution, civil liability and professional sanctions respectively. 36, 41, and 35 jurisdictions implemented laws allowing dispensers immunity in the same domains. 38 and 46 jurisdictions gave laypeople administering naloxone immunity from criminal and civil liability. 47 jurisdictions implemented laws allowing prescription of naloxone to third parties. All jurisdictions except Nebraska allowed pharmacists to dispense naloxone without a patient-specific prescription. 15 jurisdictions removed criminal liability for possession of non-prescribed naloxone. The 10 states with highest average rates of opioid overdose-related mortality had not legislated in a higher number of domains compared to the 10 lowest states and the average of all jurisdictions (3.4 vs 2.9 vs 2.7 respectively).  

Conclusion  
Effective involvement of bystanders in early recognition and reversal of opioid overdose requires removal of legal deterrents to prescription, dispensing, distribution, and administration of naloxone. Jurisdictions have varied in degree and speed of creating this legal environment. Understanding the integration of legislation into epidemic response may inform the response to this and future public health crises. References  

Keywords  
Bystander Aid Naloxone Opioid Overdose Health Policy Public Access Naloxone
Examining a Partnership between Youth and Community Stakeholders in Violence Intervention

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Background: Chester, Pennsylvania is recognized as one of the most violent cities per capita in the United States. Many cities similar to Chester have implemented a variety of both hospital and community-based programs to reduce youth violence. These programs engage youth in violence intervention efforts, however little is known about how to enhance positive engagement between at-risk youth and community stakeholders. The objective of this study is to elicit similarities and differences in perspectives from at-risk youth and community stakeholders in forming a partnership to reduce violence in Chester, PA. Methods: The study design incorporated one psychoeducational town hall session with youth participants, regarding topics related to the causes and consequences of community violence, and one town hall session with both youth and community stakeholder participants, discussing topics related to reducing community violence. After the town hall sessions, 15 semi-structured interviews were conducted to elicit stakeholder and youth reactions to their town hall sessions, their experience with violence in Chester, stakeholder/youth partnerships, and potential barriers to partnerships that could reduce violence. Results: There were 7 youth participants, all clients of a local youth mentorship organization, Team Making A Change group and 8 adult community stakeholders. Emergent themes include: 1) lack of socioeconomic resources available to the Chester community or inability to escape violence due to socioeconomic status; 2) a need for creating a social support network of people and professionals willing to invest in the development of the youth in Chester; 3) fear and anxiety of gun violence at any given moment; 4) adults serving as role models for youth and setting examples of work ethic, hope, and commitment; 5) the need for gun control to mitigate gun violence; 6) the benefit of youth mentorship programs both for social asset building and allowing youth to express themselves. Conclusion: Both youth and community stakeholders acknowledge the importance of building social assets, via mentorship and community programs, as a means to reduce youth violence. A larger scale evaluation of these findings can inform the development of community-based violence intervention efforts.

Keywords
social emergency medicine, injury prevention, trauma, community-based participatory research
Introduction:Asthma is a prevalent disease process, affecting over 8% of adults and children and accounting for ~1.8 million emergency department visits annually in the United States. Inhaled bronchodilators, such as short-acting beta agonists like Albuterol, are the mainstay in the management of acute asthma exacerbations. The administration of nebulized medication is not included in the national EMT scope of practice model, but is included for AEMT and Paramedic level providers. The purpose of this investigation is to describe the overall prevalence of Statewide Treatment Protocols (STPs) that allow for BLS nebulizer administration of bronchodilators in asthma protocols.

Methods:Cross sectional study of STPs utilizing a standardized review examining asthma, wheezing or respiratory distress protocols for inclusion of BLS administration of nebulized bronchodilators. Protocol revision date was also captured. Results:Thirty five out of fifty (70%) states issue BLS STPs, twenty four of which are mandatory, while the remainder serve as guidelines. Of the twenty four states that issue mandatory BLS STPs, only ten (42%) include albuterol nebulizers as an approved medication. Four (36%) of the guideline protocol states allow for BLS bronchodilator administration. Pediatric administration is allowed in nine (90%) of the mandatory protocols. Twenty nine (83%) of the STPs have been revised since 2015. Discussion:Bronchodilators are a life-saving mainstay for the treatment of asthma and bronchospasm. EMT administration of bronchodilator nebulizers would allow the initiation of treatment at an earlier point with relatively low risk of adverse effect to the patient. The National Scope of Practice does not allow for BLS administration of nebulized bronchodilators but almost half of states with mandatory protocols allow for administration. The large majority of protocols have been revised within the past 3 years, demonstrating that out-of-date protocols are unlikely to be the cause of this limitation. Further investigation is needed to examine obstacles to including bronchodilator nebulizers in BLS STPs and consideration for inclusion in the National Scope of Practice Model.

Keywords
EMS, Pharmacology, Protocols, Operations
Feasibility and Acceptability of a Music-Based Intervention for Acute Pain

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Background: Music has long been explored as a treatment intervention. Given its psychological mechanism in improving affect and decreasing anxiety and catastrophizing, music is expected to reduce pain severity. This concept has been tried in perioperative pain, but never conclusively in an emergent setting. With music delivery evolving significantly through the use of readily available portable devices, cloud computing and machine learning algorithms, music is potentially a viable, personalized pain management option across settings. Methods: We piloted use of a smartphone-based intervention, Unwind, to manage pain in emergency department observation unit bound patients being treated with opioids. Unwind was designed to deliver music generated to modulate heart rate and pain. Eligible participants were enrolled by research staff. We collected basic demographic data, opioid use history, and a brief psychosocial phenotyping survey. We then demonstrated the use of Unwind. Participants were randomized to either use Unwind completely at their own volition (self-driven) or to complete sessions with research staff support. Pain and anxiety information was collected before and after each music session. At the end of study participation, we asked questions about the experience of using Unwind to manage pain. Results: We enrolled 84 participants; 74% were female, 48% were randomized to the self-driven arm, 76% completed the entire study. Mean age was 44 (+/- 15) years. Between the 2 arms: Baseline pain, catastrophizing, anxiety, sleep disturbance, baseline opioid use were not different. Seventy-three participants attempted at least 1 music session (mean 3 sessions per participant, maximum 9 sessions by a participant). Participants attempted more sessions when prompted by research staff; the number of successful sessions did not vary by study arm. Individuals found Unwind acceptable; most described its primary use for distraction from their pain or to manage anxiety in the hospital setting. Conclusion: This personalized, novel intervention is feasible to implement and acceptable to participants. The ease and scale of delivering such an intervention through music apps on smartphones make it an encouraging proposition to address pain equitably on a population level. The effectiveness, mechanism and scalability of this approach should be the focus of future research.

Keywords
music, pain, technology, equity, opioids
Feasibility and Initial Efficacy of GAPcare: the Geriatric Acute & Post-acute Fall Prevention Program

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BACKGROUND
Falls are the leading cause of injury-related mortality and ED visits among older adults. EDs frequently evaluate seniors after falls, but there is no current fall prevention model in US EDs. ED patients who present for falls have a 30% higher risk of falling in the subsequent 6 months than age-matched controls. We present the progress to date for a US ED pilot investigation of a multidisciplinary fall prevention protocol. METHODSGAPcare is a pilot single-blinded randomized controlled study. Seniors (≥ 65 years-old) who present to one of two academic US EDs after a fall are eligible. We randomly assign participants 1:1 to an intervention or control arm. In the intervention arm, an ED physician, pharmacist, and physical therapist (PT) collaborate to identify and address risk factors that may have contributed to the fall. Intervention arm participants and their caregivers return home with a medication-related action plan to taper or stop potentially inappropriate medications and an individually-tailored PT assessment and plan. Participants in the control arm receive standard assessments and care and a home safety brochure. Participants in both study arms complete fall calendars for six months to document the number of falls and healthcare visits during follow-up. The primary outcome is feasibility of GAPcare in the ED. The secondary outcome is to estimate initial efficacy in preventing recurrent falls and hospitalizations at six months. RESULTS We have enrolled 86 of the planned 120 participants. Participants have a median age of 81 years (IQR 75-89); 69% are female and 18% screened at high risk for cognitive impairment. The intervention and control arms were similar in age and cognitive status. ED consults were brief with a median duration for pharmacy of 19 min. (IQR 12-23) and PT of 22 min. (IQR 15-30). ED LOS was not significantly different in the intervention and control arm. While the pilot is not powered for efficacy, initial results are promising; intervention participants experienced 78% less falls (incident rate ratio (IRR) 0.22; 95%CI 0.08-0.65) and 39% less hospitalizations (IRR 0.61; 95%CI 0.03-1.41). CONCLUSION The GAPcare fall prevention intervention has the potential to promote older adult-sensitive care for millions of Americans presenting to EDs after falls and establish a protocol for a future large-scale randomized controlled trial on this topic.

Keywords
geriatrics; seniors; falls; injury prevention; physical therapy; pharmacist; intervention; randomized controlled trial; clinical trial; pilot; emergency department

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Feasibility of a Hospital-wide Electronic Health Record Enabled Airway Registry

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Background: Tracheal intubation performance is evaluated using first-pass success (FPS) and complication rates derived from airway registry data. Current registries require manual data entry separate from clinical documentation and are validated through comparison with procedural coding. We sought to develop an electronic health record (EHR) airway note paired with clinical reporting to capture all emergent airway procedures. This reporting system will serve as the basis for quality improvement (QI) and potentially, a scalable airway registry. Methods: We convened a multi-disciplinary team from anesthesiology, EM and otolaryngology to identify the components of an airway note via a modified Delphi method. A user interface and reporting system was designed with structured and free text fields integrated within our EHR. Specific variables are auto-populated including patient identifier, date-time, author and specialty. The data was then exported from a EPIC® Crystal report into a RedCap database for HIPPA-compliant storage. The airway note was implemented January 1, 2017 and data analyzed through November, 1 2018. Results: 1125 non-operating room (OR) intubations were captured over 24 months, 627 by anesthesiology and 498 by EM. Of the 452 ED intubations, 98.2% were performed by EM and 1.8% by anesthesiology. Anesthesiology managed all 673 non-ED intubations. Our airway note achieved 100% capture of institutionally coded non-OR intubations. The average capture rate across all data fields was 68.7% ±32.6%, excluding narrative fields. We calculate a hospital-wide FPS rate of 84.5% and complication rate of 5.5% ± 2.3%. Conclusions: To our knowledge, this is the first airway registry with integrated clinical reporting that achieves 100% capture of all documented non-OR intubations across multiple specialties and hospital units. The registry mitigates potential reporting bias through automated capture of clinical documentation. Baseline FPS is congruent with a FPS rate of 84.1% reported in a recent systematic review of airway literature. Limitations of our collection methods include incomplete data entry and the need for data cleaning. This registry will support tracking of future QI initiatives including the use of pre-procedure checklist, video laryngoscopy and apneic oxygenation.

Keywords
airway management
Focused Needs Assessment and Training for Emergency Care Providers in the Prehospital Setting in Rwanda

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Background: Prehospital care is a critical component of emergency care worldwide, including in countries such as Rwanda. Studies have noted that basic affordable training positively effects EMS systems. This study aims to identify prehospital providers and assess the current state of prehospital care through a needs assessment and subsequent focused training intervention.Methods: A prospective, nonrandomized interrupted time-series approach was utilized for a needs assessment and training intervention that focused on knowledge of key process indicators including: patient assessment, airway intervention for respiratory distress, intravenous fluids in shock, and glucose for hypoglycemia. Thirty direct patient care providers were identified through the prehospital medical command office and included as participants. Ambulance drivers or administrative staff not directly involved in patient care were excluded. Data collected through a closed and open-ended questionnaire included age, gender, training, and knowledge assessment. The data was used to create a tailored eighteen-hour educational intervention after which an immediate post test was administered.Results: Of the 30 prehospital providers, 60% (n=18) female and 40% (n=12) male, 19 were nurses and 11 were nurse anesthetists. The median age was 36 years and median time providing care was 10 years (IQR: 7,11). 24 participants completed both the baseline and post-test. The mean baseline score was 7.2 (SD = 1.6), and this significantly increased to a mean posttest score of a 10.5 (SD = 1.2). This represents a 56% (95% CI: 36.2, 75.8) increase in mean score pre to post test. Scores in the categories of patient assessment, respiratory intervention, and fluid therapy improved by 8%, 21% and 8% respectively. There was no significant change in correct answers regarding administration of glucose. All participants noted they would prefer further training.Discussion: This study provided important insights on the prehospital care system in Rwanda and demonstrates that a tailored intervention targeting education on pre-hospital process indicators have positive impacts on pre-hospital provider knowledge base. Further studies are needed to demonstrate the impact of training on patient care and outcomes.

Keywords
Rwanda, emergency care providers, needs assessment, training
Formative Evaluation for ED-initiated Buprenorphine User-Centered Decision Support

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Background: Buprenorphine (BUP) is an effective treatment option for patients with opioid use disorder (OUD) that can safely be initiated in the ED yet is rarely initiated as a part of routine ED care. Clinical decision support (CDS) represents one approach to potentially accelerating adoption of ED-initiated BUP into routine emergency care. Our objective was to develop a user-centered decision support tool for ED initiation of buprenorphine for patients with OUD.

Methods: A multi-phase user-centered design (UCD) methodology with iterative prototype development was used. Primary phases included 1) Needs assessment, 2) Initial Prototype Design, 3) Iterative Design Feedback, and 4) Prototype testing. Participants included 26 attending and resident physicians. Feedback was gathered using static and interactive prototypes. Formal UCD sessions presented a use case for participant walkthroughs of the prototype. Iterations concluded once thematic saturation was reached. A total of five prototypes were evaluated and iteratively refined.

Results: Needs assessment findings led to initial prototype design which guided users through patient evaluation for OUD, assessment of opioid withdrawal severity, the protocol for initiating BUP, and patient referral for continued treatment. Early user feedback identified concerns with this CDS design which activated as an alert. Timing of the alert led to quick dismissal without using the tool. Subsequent UCD iterations informed development of a flexible tool to support clinicians of varied experience levels with ED-initiated BUP by providing both one-click options for direct activation of care pathways as well as user-activated decision support. The final design resolved challenging navigation issues through targeted placement, color, and design of the decision support modules and care pathways.

In final testing, users expressed that the tool was easily learned without training and was reasonable for use during routine emergency care. Conclusions: A user-centered design process helped designers better understand users’ needs for a web-based clinical decision tool to support ED initiation of buprenorphine for OUD. The process identified varying needs across user experience levels and familiarity with the protocol, leading to a flexible design supporting both direct care pathways and user-initiated decision support.

Keywords: user-centered design; formative evaluation; clinical decision support; ED-initiated Buprenorphine
Google Form to Obtain Didactic Attendance and Teaching Feedback

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Background It is key to our residents’ success that they have an opportunity to attend our didactic curriculum. Faculty improve their teaching by receiving feedback on their didactic presentations. Both the RRC and the ACGME via the annual residency survey query for data on resident conference attendance. We have lacked a tool to easily collect attendance data and feedback for faculty on their didactic teaching in a way that was not cumbersome or time consuming for the respondent and our program coordinator (PC). We set out to create a tool to collect attendance data and faculty teaching feedback. Given the high administrative time burden and low response rate of our previous system of individual email response, we hoped to design a system that would increase response rate and decrease the amount of work required to process the data. Methods We trialed multiple available resources to identify a solution to obtain our data points of attendance and teaching feedback. Google Forms was identified as a user-friendly solution to achieve our goals. A template is used to create an attendance Google Form from our didactic calendar, this task takes less than 5 minutes. At the conclusion of the didactic day, a link to the form is sent to our faculty and resident email lists and individuals can easily respond to the form on their phone using only their name. A Google Sheet is automatically generated that lists the respondent name, hours of lecture attended, and the feedback for each faculty. Results This change has reduced the time required by our PC to compile conference attendance and allows our residents to more accurately reflect their attendance. Although we do not have data prior to this innovation, we believe there has been an increased response rate for both attendance and faculty feedback. Over a 6-month period we averaged 35 respondents out of 29 residents and approximately 25 faculty. Although we provide an opportunity to submit an absent response, we believe that absent faculty represent the majority of our non-responders. Conclusion Google Forms can be used as an effective tool to obtain both attendance and faculty feedback following an emergency medicine didactic conference. This tool could be easily implemented by an emergency medicine residency to reduce the administrative burden on their program coordinator responsible for collecting this information.

Keywords
Education, Informatics, Attendance, Feedback, RRC, Program Coordinator
Background: The cascade of care for hepatitis C Virus (HCV), from diagnosis through treatment, is challenging, with multiple points of drop-off. Determining the best sites to identify infected patients while simultaneously successfully linking them to care (LTC) has a significant impact on program efficacy and cost-effectiveness. Our objective was to compare the rates of HCV identification, LTC, and treatment success between different study sites at our medical center, including the Emergency Department (ED), 3 outpatient clinics, and the inpatient setting.

Methods: This is a descriptive analysis of the results of a protocol that integrated HCV screening into clinical services throughout multiple departments in our medical center. Each site utilized a multi-purpose Best Practice Advisory (BPA) to increase screening, and the screening strategy varied at each site depending on the needs of the site. We analyzed the differences in demographics, navigation and linkage outcomes, and post-linkage treatment completion. Pearson's chi-squared test was used to test for statistical independence for each categorical variable across all sites, and one-way ANOVAs were used to test the equality of each continuous variable across all sites.

Results: 28,435 patients were screened across 5 clinical locations. The ED screened 13,829 patients with an HCV RNA+ prevalence of 7.2% and an MD linkage rate of 32.8%. Inpatient ward screened 1,031 patients with an RNA+ prevalence of 14.8% and a linkage rate of 23.3%. General Internal Medicine screened 10,546 patients with an RNA+ prevalence of 3.9% and a linkage rate of 69.0%. Infectious Diseases screened 1,200 patients with an RNA+ prevalence of 4.0% and a linkage rate of 77.3%. Family Medicine screened 1,829 patients with an RNA+ prevalence of 2.0% and a linkage rate of 80.0%. ED and inpatient sites had the highest rates of homelessness, active IDU, and co-morbid conditions. Once linked, a significant portion of patients were started on medications regardless of site of diagnosis, and sustained virologic response rates at 3 months were high across all groups.

Conclusion: Across our medical center, different sites of HCV screening captured unique patients with distinct barriers to success toward completing the cascade of care. LTC and outreach strategies need to be tailored to the location where patients are diagnosed to meet diverse patient needs.

Keywords
HCV Screening
Heart Rate Variability in Emergency Physicians Over the Course of the Year

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Background. Wearable devices with photoplyethsmography (PPG) technology can provide continuous physiological monitoring of subjects, including heart rate (HR) and heart rate variability (HRV) data, and is used by competitive athletes to track improvements in performance and monitor stress. Despite the implications to physician training, wellness, and performance, this technology has not been used much in emergency physicians (EPs). In this study of emergency physicians, we sought to determine if HR or HRV patterns changed over the academic year.Methods. EPs at an urban academic ED wore Empatica E4 photoplyethemographs during clinical shift work, once per quarter, over an academic year. Continuous recordings were captured over the entire shift while performing routine clinical care. PPG data were used to calculate HR and HRV data using time-domain and frequency-domain analysis. Standard measures of HR and HRV data from the first and last quarter of the academic year were analyzed by paired Student’s T-tests.Results. Twenty-one EPs were recorded over 400 hours of data. Ten were trainees and eleven were attending physicians. In the fourth quarter of the academic year compared to the first quarter, there was no significant difference in median heart rate (75.8 vs. 76.8, p=0.57), mean R-R interval (0.81 vs. 0.80, p=0.32), standard deviation of R-R interval (0.11 vs. 0.11, p=0.93), root-mean-square of successive difference of R-R interval (0.81 vs. 0.80, p=0.96), low-frequency power (3.5 x103 vs. 3.4 x103, p=0.79), high-frequency power (8.5 x103 vs. 8.3 x103, p=0.91), or low-frequency to high-frequency ratio (0.42 vs .41, p=0.43), respectively. Analysis of the resident-only subgroup also revealed no significant differences in the fourth quarter compared to the first for any of the analyses. The post-hoc estimated power for these analyses was over 0.80.Conclusion. No significant differences in HR or HRV analyses were found at the end of the year compared to the beginning. While HR and HRV analyses may be useful in other domains, it may have limited application in the study of physician performance and training.

Keywords
heart rate variability

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How do Providers’ Feel?  A Qualitative Study of Providers’ Emotions in the Emergency Department

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Background: Although patient safety experts have asserted that providers’ emotions can adversely influence patient care, almost no research has investigated providers’ emotional experiences or the effects of these experiences on patients. This study aimed to explore these experiences to inform the development of interventions to improve patient safety in the Emergency Department (ED).  

Methods: Purposive sampling was used to recruit ED providers from 4 academic and 4 community hospitals. In one-on-one, semi-structured interviews, providers were asked to describe their emotions in the ED, emotional triggers, beliefs about emotional influences on patient safety, and strategies to manage emotions. We employed Grounded Theory to identify emergent themes in the data. 

Interviewing continued until theoretical saturation was achieved. Audio-recorded interviews were transcribed and coded by 3 research team members using open, axial, and selective coding. Results: We interviewed 86 providers (45 attending physicians, 41 registered nurses). Nearly all reported routinely experiencing a wide range of emotions, particularly negative emotions (most notably anger/irritation/frustration, followed by anxiety/fear and sadness). 

These emotions resulted from (a) patient factors (e.g., unrealistic expectations, challenging behaviors), (b) hospital factors (e.g., staff miscommunication, hospital policies), and (c) system factors (e.g., patient boarding, lack of resources). Patient-evoked anger was identified as most likely to adversely influence patient care by reducing time and energy spent on a patient, reducing the perceived seriousness of a patient’s concern, and increasing likelihood of premature cognitive closure. Common strategies to manage emotions included (a) emotional suppression (e.g., distraction), (b) cognitive reappraisal of emotional situations, (c) increasing self-awareness of feelings, and (d) physically taking breaks (e.g., leaving bedside). Conclusion: Emotionally-evocative patients, stress, and ED conditions can trigger negative emotions in providers, which in turn can compromise patient safety. Providers attempt to regulate emotions to reduce adverse effects on patients. Additional research is needed to determine if these strategies are effective and to inform the development of interventions.

Keywords  
patient safety, emotions, decision-making, qualitative research

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Background: Opioid Use Disorder (OUD) related deaths have increased exponentially since 2000, with a record 72,000 deaths in 2017. The emergency department is the front line of health care’s response to this epidemic. New state and national laws seek to increase access to OUD treatment. Before implementing quality improvement changes, hospitals first need to quantify how well ED providers treat patients with OUD. Methods: A retrospective analysis of patient charts from October 2018 was performed. Care was provided at an urban academic ED with annual volume of 135,000. Patients were identified by ICD coding of both primary diagnoses (n = 144, Defined as: ED visit directly related to OUD) and secondary diagnoses (n = 253, Defined as: ED visit for a complication of OUD or non-OUD related complaint). Charts were excluded for age <18, pregnancy, or dispositions of admission, against medical advice, or eloped. Charts were reviewed for resources provided: substance use counseling within 14 days, methadone or buprenorphine-naloxone administered in ED, buprenorphine-naloxone prescription given on discharge, naloxone-kit given at discharge. Results: Primary OUD: 65% of patients received at least one OUD treatment resource. 60.4% had substance use counseling within 14 days (95%CI 52.3-68.0). 3.5% received buprenorphine-naloxone/methadone in ED (95%CI 1.5-7.9). 2.8% of patients had buprenorphine/methadone prescribed (95%CI 1.1-6.9). 4.8% of patients were given a naloxone-kit at discharge (95%CI 2.4-9.7). Secondary OUD: 31% of patients received at least one OUD treatment resource. 21.7% of patients had substance use counseling within 14 days (95%CI 17.1-27.2). 1.9% received buprenorphine-naloxone/methadone in ED (95%CI 0.8-4.5). 3.5% of patients had buprenorphine-naloxone prescribed (95%CI 1.9-6.6). 0.7% of patients were given a naloxone-kit at discharge (95%CI 0.2-2.8). Conclusion: In a large urban academic ED, a majority of patients presenting with a primary OUD diagnosis receive treatment. Secondary diagnosis OUD patients may receive treatment, but less than those above. There is opportunity for improvement in our care of both of these groups. MAT is not routinely performed in our ED. Identification of patients not receiving optimal OUD therapy is essential to addressing this epidemic.

Keywords
opioid use disorder, substance use treatment, buprenorphine, naloxone
Identification of Bottlenecks in Patient Flow: A Simulation Study

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Background
Computer simulation enables providers to identify bottlenecks in patient flow and predict downstream effects of proposed changes. Prior studies on patient flow have focused on intervention without identifying the precise source of bottlenecks. In this study, we test the downstream effects of modifying several variables on patient flow to enable targeted allocation of hospital resources.

Methods
A computer simulation of an academic medical center-associated psychiatric emergency room (PES) with twelve beds and an annual census of approximately 7500 patient visits was built using JaamSim, an open-source simulation software, based on clinical data collected between February 2013 to July 2013. Input parameters of the model were calculated retrospectively from the electrical medical record system. Tested variables included the number of available providers (1 ~ 3), the number of available beds (12 ~ 19) and the length of boarding time (1 hour ~ 7 hours).

Results
A total of 3,066 visits to PES were reviewed for input parameter calculation as well as simulation verification. The addition of a provider during the evening shift showed the greatest decrease in time-to-bed, time-to-provider and total length of stay (LOS) with reductions of 77%, 72%, and 25%, respectively. Increasing the number of available beds had minimal effect on total LOS. Decreasing boarding time showed 3 to 4% decrease in total LOS per reduced hour.

Conclusion
This simulation identified the number of available clinical providers as the primary bottleneck to patient flow in this PES. The addition of a provider during the evening shift showed the greatest improvement in treatment times, suggesting a relative lack of providers during this time period. While our study is limited by its simplification of PES workflow, it utilizes a pattern that is universal to most emergency rooms and may be generalized to other clinical settings.

Keywords
computer simulation, patient flow, emergency department crowding
Impact of Multidisciplinary Team Huddles on Patient Safety: A Systematic Review

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Background
Daily safety huddles—brief, structured discussions to identify and respond to safety risks—have been credited with enhancing safety culture in operationally-complex industries such as aviation and nuclear power. More recently, safety huddles have been endorsed as a mechanism to improve patient safety in health care. Safety huddles have proliferated across hospitals, both within and across clinical units, including the ED. The purpose of this review is to synthesize the literature related to hospital-based safety huddles and their impact on patient safety.

Methods
We conducted a systematic review of peer-reviewed literature related to daily, multidisciplinary, hospital-based safety huddles (excluding perioperative huddles, the subject of another recent review). We undertook an initial search of PubMed—targeting the terms “huddle AND hospital AND safety”—in February 2018, with an updated search in July 2018. Our eligibility criteria screened for studies: (i) Published on or after January 1, 2008, (ii) In which the huddle was the primary intervention being assessed, and (iii) That evaluated the huddle’s apparent impact on at least one metric.

Results
Our search returned 37 unique articles, of which 12 met our eligibility criteria for review. Only one of the 12 studies was both prospective and controlled. Seven studies reported descriptive measures of huddle programs, including attendance and type and frequency of issues identified during huddles. Other studies variously assessed the impact of huddles on metrics related to clinical outcomes (four studies), safety culture (two studies), clinical processes (one study), ED boarding (one study), and quality (one study). Of the seven studies reporting changes in metrics over time, three studies reported metric improvement after huddle implementation, whereas the remaining four studies reported mixed results.

Conclusion
While anecdotal accounts of successful huddle programs abound, peer-reviewed evidence regarding the effectiveness of hospital-based safety huddles is in its earliest stages. Further rigorous research—focused on the design, implementation, and outcomes of huddle programs—would enhance the collective understanding of how safety huddles impact clinical quality and patient safety.

Keywords
Safety, Clinical Operations, Capacity Management, Leadership
Impact of Non-Clinical Staff Callback Program on Return ED Visits and Hospitalizations

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Background Post-emergency department (ED) discharge callback programs have proven valuable by decreasing ED revisits. However, program operation is often costly and time consuming. Traditional staffing models employ nurses, advanced-practice practitioners, emergency physicians, or contracts with third-party companies. We aimed to create a callback program to decrease avoidable post-ED discharge revisits and hospitalizations while also minimizing costs by staffing with trained non-clinicians.

Methods We conducted a prospective cohort study of patients at high risk for return ED visits or hospitalizations after ED discharge. The cohort was defined a priori based on discharge diagnoses and other clinical and/or demographic characteristics. The study took place at an urban academic and community ED, from February 2017 to September 2018. Using scripted clinical scenarios, we trained pre-health profession students to review discharge instructions with patients, encourage outpatient follow-up, emphasize medication adherence, provide care linkage, and escalate the call to a physician assistant (PA) when urgent medical questions arose. Callbacks occurred within 48 hours of discharge, 89% within 24 hours. We compared rates of ED return visits and hospitalizations within five days of ED discharge across three categories: “called and connected (CC),” “called and not connected (CNC),” and “not called (NC).”

Results During the study period, 90,705 patients were discharged from both EDs, of these 13,100 patients met inclusion criteria and 4,195 (32%) were CC, 2,961 (23%) were CNC, and 5,944 (45%) were NC. Staffing limitations prevented us from calling all eligible patients. Four percent of calls were escalated to a PA. CC patients had decreased rates of ED return visits within five days (4.2%) compared to CNC (11.4%) and NC (10.7%) patients. CC patients also had decreased rates of hospitalization within five days (1.1%) compared to CNC (3.0%) and NC (2.2%) patients. Non-clinician employment costs (1.4 FTE, 8 hours/day, 7 days/week) were less than half the cost of one FTE nurse ($46,216 vs. $105,000).

Conclusions A cost-effective non-clinical staff callback program reduced post-ED discharge return visits and hospitalizations within five days of ED discharge among a high-risk cohort.

Keywords
Discharge, Callback, Return visits, return hospitalization, Cost-effective, non-clinician
Impact of Road Safety Laws in Colombia on Road Traffic Collision Fatalities and Injuries

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Background: Road traffic collisions (RTC) are the leading cause of preventable death among those aged 15–29 years worldwide. More than 1.2 million lives are lost each year on roads. Ninety percent of these deaths take place in low and middle-income countries. The General Assembly of the United Nations (UN) proclaimed the period from 2011-2020 the “Decade of Action for Road Safety”, with the objective of stabilizing then reducing the number of deaths by 50% worldwide. In this context, the government of Colombia established the National Road Safety Plan (PNSV) for the period 2011 – 2021 with the objective of reducing the number of fatalities by 26%. However, the effectiveness of road safety policies in Colombia is still not known. Methods: To evaluate the effect of road safety laws on incidence of RTC, deaths and injuries in Colombia. RTC data and fatality numbers for the time-period January 1 2010 to December 31 2017 were collated from official Colombian governmental publications and analysed for reductions and trends related to introduction of new road safety legislation. RESULTS: Data analysis are expected to be completed by February 2019. Conclusion: RTC remains the leading preventable cause of death in Colombia despite the PNSV. Data is being mined to determine the trends of these rates of crashes and fatalities, and their relation to the introduction of national traffic laws. Overall, while the absolute number of RTC and deaths has been increasing, the rate of RTC per 10,000 cars has been decreasing. This suggests that although the goals of the PNSV may not be realized, some of the laws emanating from it may be beneficial but warrant further detailed analysis.

Keywords  
Road traffic collisions  
Road Safety  
Road Deaths  
Injury Prevention  
Public Health
Implementation of a New Ultrasound Documentation System and Impact on Documentation Compliance

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Background: Clinical ultrasound (CUS) is ubiquitous in academic emergency departments. Tracking scans for quality assurance (QA), credentialing, and billing is a critical piece of ultrasound data management. Recently, our institution transitioned to a commercially available QA system (QpathTM) integrating CUS exams into the electronic medical record (EMR). After initial training, the system was rolled out July 1, 2018. An additional training intervention for all residents was held September 5, 2018. The objective of this study was to analyze resident and attending documentation before and after a training session with a new CUS QA system. Methods: This is a quality improvement project to retrospectively study EM resident and attending physician CUS documentation compliance pre-and post a training session on the use of Qpath. The study was conducted at a single academic, urban medical center. We reviewed QA data collected on resident and attending utilization and compliance 66 days before and 66 days after training intervention. We also reviewed extended focused assessment with sonography in trauma (EFAST) exams to analyze compliance as a trauma order set including EFAST was implemented at the time of the training intervention. Chi-square test with Yates correction was used to determine significance between the pre- and post-intervention groups. Results: 1,153 scans were uploaded pre-intervention compared to 1,200 scans post-intervention. There was no significant difference in the number of scans with documentation complete for QA (n = 666 vs 700; p=0.81) or billing (139 vs 140; p=0.76) post intervention. Documentation compliance significantly increased among the post-graduate year one resident group (464 vs 517, p=0.03). EFAST exams meeting full documentation compliance also increased (91 vs 110, p = 0.09) but not significantly. Conclusion: We did not find a significant increase in ultrasound documentation compliance after this training intervention, except among the post-graduate year one resident group. This group had the benefit of learning one QA system rather than changing between systems. There was an increase in ordering, documentation compliance, and billing for EFAST exams that trended toward significance. This is likely related to the addition of an order set. This suggests that process measures may have more benefit versus additional training.

Keywords
ultrasound, resident education, quality improvement
Implementation of an ED Observation Pathway for Patients With Mild Traumatic Intracranial Hemorrhage

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Background: Patients with mild (GCS ≥ 14) traumatic intracranial hemorrhage (t-ICH) are frequently transferred to hospitals with neurosurgical expertise. Such transfers are costly, resource intense and inconvenient for patients. We sought to investigate the safety and feasibility of an ED observation pathway for patients with mild t-ICH, including inter-facility transfers. Methods: Retrospective, single-center study of ED patients presenting to a Level 1 trauma center, 04/2016 – 08/2017. Inclusion criteria: Isolated head injury, GCS ≥ 14, minor positive CT findings (traumatic SAH, SDH. Results: There were 66 patients included, mean age 65 ± 22. 3 years, 44% female. Major ICH types: SDH (n=36), SAH (n=21), IPH (n=5). Fifty-one patients (77%) were enrolled in ED observation. Seven patients (10.6%) subsequently failed observation, requiring admission; however, only one was admitted for sequela of t-ICH. LOS was significantly decreased among observed vs admitted patients (16.8 vs 88.4 hours, p= 0.0001). Repeat CT demonstrated increased SDH volume in two patients; no intervention was required. Among 50 inter-facility transfers, 37 (74%) qualified for observation; 32/50 (64%) were discharged after observation. Conclusion: In patients with minor t-ICH, ED observation is a safe option with significantly decreased LOS. Appropriately selected patients may benefit from an ED observation protocol. This pathway has potential for use in the community setting to prevent unnecessary transfers/admissions, and warrants further study.

Keywords
TBI, ICH, ED Observation
Implementation of Shock Index Display in an Electronic Health Record

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Background: Shock Index (SI) is calculated from heart rate (HR) divided by sBP. SI elevation predicts severity of illness in a variety of clinical scenarios even when HR and/or sBP are normal. However, SI is not displayed along with vital signs in our EHR and in our experience staff do not routinely consider SI. We hypothesized that displaying SI along with routine vital signs could increase clinical usage of SI. This cycle of our SI-focused quality improvement project aimed to assess current SI usage and potential effects of a planned change idea while simultaneously engaging staff through principals of co-design to contribute to building SI display into our EHR towards goal of wider usage of SI.

Methods: An information technology (IT) request was created to add SI to display with vital signs within the hospital-based EHR, (EPIC®) in multiple view locations. A preliminary build was developed and screenshots disseminated to staff via email and also included in the survey. A cross-sectional anonymous Qualtrics® survey of ED clinical and managerial staff was administered, including Likert scale and multiple choice with free text option questions.

Feedback from the survey was utilized to optimize the SI display build prior to implementation. Results: 34 survey responses were received. In current state on a 1-5 Likert scale, (1=Always, 5=Never), only 24% (95%CI 12%-40%) of respondents indicated they use SI “Always” or “Most of the Time”, 35% “Never” (95%CI 21%-52%). If SI were to be displayed more prominently, as represented in build screenshots, 76% (95%CI 60%-88%) indicated they would use SI “Always” or “Most of the Time” and only 3% “Never” (95%CI 0.5%-15%). 94% (95%CI 80%-98%) approved of display and 4 provided free text suggestions (which were incorporated into build). Conclusions: To our knowledge, this is the first reported instance of SI being displayed prominently in the EHR along with vital signs. Survey data and testing with participant co-design of the change prior to implementation demonstrated that a minority of staff employ SI in current state and a majority would use SI if displayed along with routine vitals. Further cycles will test the impact of displaying SI within the EHR on impact on early identification of critical illness.

Keywords
Shock Index
Improvements to Electronic Medical Record Result in Increased Hepatitis C Screening and Treatment

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BACKGROUND The prevalence of Hepatitis C virus (HCV) at Boston Medical Center (BMC) is 8%, 4 times higher than the national average of 2%. Patients seen at the Emergency Department and at our two major adult primary care outpatient settings were not consistently screened per guidelines for HCV prior to our intervention. Patients who tested positive for HCV had difficulty accessing and remaining engaged in care. Boston Medical Center (BMC) is the largest health safety net hospital in New England and is located at the crossroads of several socioeconomically marginalized neighborhoods that are disproportionately affected by poverty, homelessness, substance use, crime, and infectious diseases. The goal of our intervention was to increase Hepatitis C screening for patients in the birth cohort (born between 1945 and 1965) by utilizing a Best Practice Alert (BPA) at multiple sites.

METHODS The first HCV BPA was implemented at the Emergency Department (ED) in July 2016. An electronic medical record (EMR) enhancement using an HCV hard stop BPA with lab order prompting the clinician to order HCV labs was used to modify existing workflows. The second HCV BPA launched in the General Internal Medicine (GIM and Family Medicine (FM) outpatient clinics in July 2017.

RESULTS After turning on the ED Hep C Screen Base-Enter Order BPA at the ED, clinicians chose the Hep C BPA with Lab Order 3,936 times, 39% of the time the order fired, corresponding to a 6,950% increase in the rate of testing in the ED compared to the preintervention period. GIM and FM clinicians chose the Hep C BPA with Lab Order 1,374 times, 36% of the time the order fired, corresponding to an 868% increase in the rate of testing in both outpatient primary care clinics compared to the preintervention period.

CONCLUSIONS IT modifications can create clinician behavior change that leads to more test ordering. All stakeholders must have a clear understanding on the patient-specific and public health benefits behind the intervention and early IT involvement is key in achieving this goal. A multidisciplinary approach comprised of IT and HCV clinical experts is key. HCV champions agreed on a common clinical pathway to triage all HCV patients to the adequate level of care. Patient navigation is crucial in assessing social determinants of health issues that interfere with linking patients who test positive to Hepatitis C care.

Keywords
Electronic Medical Record, Hepatitis C Screening, Clinician Behavior, Best Practice, Increased Screening and Treatment, Linkage to Care, Patient Navigation
Improving Throughput and Length of Stay With a Cost Neutral Lean Process for Ambulatory Patients

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Background: Various Lean driven triage changes are described in the emergency medicine literature, although these often incorporate multiple simultaneous process changes, have lengthy planning periods, and require additional staffing and resources. We describe a simple, cost neutral, Lean driven process that utilizes bed assignment by the triage nurse to decrease door to room (DTR) as well as door to doctor (DTD) time for ambulatory patients arriving at a single center community emergency department when beds are frequently available.

Methods: Over the course of a four-week period, a multi-disciplinary team using value stream mapping and other Lean tools identified an opportunity for the triage nurse rather than the resource nurse to direct ambulatory patient flow. This utilized a quick registration process upon arrival to the emergency department and completion of the triage process with vital signs in the room when possible. This was particularly important between 7am and 3pm when beds are frequently available. We performed a retrospective cohort analysis comparing 1 month prior and 2 months post-intervention of ambulatory patients arriving between 7am and 3pm. The primary outcome was DTD time. Secondary outcomes included DTR time and length of stay for discharged patients. Time differences were compared using the Mann-Whitney U test for data not normally distributed.

Results: There were 1229 patient encounters pre-intervention and 2275 post-intervention included in the analysis. The median DTD time dropped from 22.2 minutes to 12.5 minutes (95% CI -9.0 to -7.1 minutes, p<0.001) and the median DTR time decreased from 9.1 minutes to 3.6 minutes (95% CI -5.1 to -4.4 minutes, p< 0.001). For discharged patients with length of stays less than 8 hours, the median door to disposition time decreased from 141.6 to 128.3 minutes (95% CI -17.6 to -4.6 minutes, p<0.001).

Conclusion: A Lean driven process change utilizing the triage nurse to assign beds for ambulatory patients can have statistically significant improvement in DTR, DTD, and door to disposition times in a community hospital emergency department. This was accomplished without any additional resources or cost to the department.

Keywords
Lean, triage, length of stay, value stream mapping, door to doctor
Incidence of Medication Assisted Treatment for Patients Hospitalized with Injection Related Complications

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Background: Injection related injuries and diseases (IRID), including cellulitis, endocarditis, and osteomyelitis have increased with the opioid epidemic. Buprenorphine and methadone are evidence-based treatments (MAT) for patients with opioid use disorder (OUD) that reduce future opioid use and decrease readmissions. However, current practices involving MAT for patients hospitalized with OUD and IRID remain unknown.

Methods: We conducted a pharmacoepidemiologic study evaluating the incidence of inpatient MAT among adult patients hospitalized with OUD and IRID in 2016 using the Premier Alliance database. We included patients hospitalized for three days or more with an ICD-10-CM code for OUD and at least 1 prespecified IRID condition. We excluded MAT first administrations occurring before hospital day 3 to avoid misclassification of home medications. We computed incidence of MAT overall and by hospital, stratified by IRID diagnoses. Multivariable regression was used to identify patient and hospital characteristics associated with MAT initiation.

Results: A total of 14,376 adults at 460 hospitals were admitted with OUD and IRID, of whom 936 (6.5%) received MAT starting on or after hospital day 3, including 857 (6%) patients who received methadone and 81 (0.5%) patients who received buprenorphine. The most frequent IRID diagnoses included cellulitis / abscess (37.8%), overdose (30.2%) and hepatitis c (19.5%). Among 297 hospitals with 10 or more admissions for OUD and IRID, 130 hospitals had no recorded MAT (median rate 4.8%, Range 0%-45%). Patients who identified as black (0.75, 95%CI 0.59-0.97 (Reference White), who were treated at non-academic hospitals (0.74, 95%CI 0.55-0.99) and hospitals in the South (0.64, 95%CI 0.43-0.96) and Midwest (0.59, 95%CI 0.42-0.83) (Reference West) had lower odds of inpatient MAT. Conversely, patients with Medicaid (1.63, 95%CI 1.33-1.94) and private insurance (1.28, 95%CI 1.01-1.62) (Reference Medicare) had higher odds of MAT. IRID diagnoses with highest odds of MAT were Hepatitis C (1.66, 95%CI 1.39-1.98), endocarditis (1.58, 95%CI 1.22-2.05) and septic emboli (1.58, 95%CI 1.23-2.03).

Conclusions: The low incidence of MAT initiation for patients admitted with IRID highlights an opportunity for emergency providers and hospitalists to improve patient care through increased early MAT induction.

Keywords
opioid use disorder, medication for addiction treatment, injection related injuries and disease
Incidence of Resident Attrition in Emergency Medicine

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Background
Despite previous study demonstrating the negative impact of resident attrition on trainees, residency leadership and potentially patient care, the rate of resident attrition in emergency medicine (EM) is unknown. We aimed to quantify the incidence of resident attrition in Accreditation Council for Graduate Medical Education (ACGME) accredited EM residencies between 2007-2016 academic years.

Methods
We performed a retrospective analysis of resident attrition in EM using de-identified resident census data from 2007 to 2016 provided by the AMA National Graduate Medical Education Census. Attrition was defined as any postgraduate who left their original residency program for any reason prior to training completion (ex. transferred to another EM program, transitioned to another specialty, withdrew, dismissed, took a leave of absence, or passed away). We measured the incidence of resident attrition and percentage of programs affected by attrition. A Cochran Armitage Trend test was used to see if there is any overall association between the attrition rate and progression of academic years.

Results
The incidence of EM resident attrition across all ACGME-accredited EM programs was an average of 0.85% per year from 2007-2016. The trend test demonstrated that there has been a very small but overall statistically significant decrease in resident attrition. An average of 22.84% of all programs were affected by attrition over the study period.

Conclusions
In the period between 2007-2016 academic year, the incidence of resident attrition is low (<1%) within the specialty of EM, especially compared to research from other specialties. However, almost a quarter of EM programs experienced at least one resident leave their program prior to the completion of their training per year.

Keywords
Attrition, burnout, residency
Instantaneous Disposition in Preparation for a Mass Casualty Incident

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Background: An important component of the hospital response to a disaster is surge capacity. A relatively unexplored component of surge capacity is the accuracy of Emergency Physicians (EPs) in creating capacity in the Emergency Department (ED). One approach is to discharge or admit as many active ED patients as possible (instantaneous disposition). The goal of this study is to establish the baseline accuracy of Emergency Physicians (EPs) in instantaneous disposition.

Methods: We conducted a prospective survey of the accuracy of rapid decision making of board certified attending EPs in an urban level 1 trauma center. EPs were asked, while working clinically, to decide within five minutes which of their active patients they could admit or discharge to return in 24 hours. Attending physicians chose which patients to report. They were not required to categorize all their active patients. We compared the anticipated and actual admissions and discharges using the chi-squared test.

Results: All 25 EPs who were asked to respond provided dispositions on 204 patients. EPs correctly predicted 85% (106/125) of discharges, and 73% (58/79) of admissions, for an overall accuracy of 80% (164/204 correctly identified as admitted or discharged). Accuracy for discharges was greater than accuracy for admissions (p < .0001). Of the 21 patients that EPs thought would be discharged but were admitted, the common reasons were persistent pain (6/21) and social reasons preventing a safe discharge (5/21).

Conclusions: The accuracy of EPs in providing instantaneous disposition is 80%, more accurate for discharges than admissions. This study provides a baseline to gauge the effect of guideline for instantaneous disposition. Weaknesses include data from a single-center and a lack of control for seasonality.

Keywords

disaster medicine, instantaneous disposition, disposition, surge capacity
Instructing Zambian Health Care Providers in Basic Emergency Care

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Background: Zambia, like many low- and middle-income countries, has a high burden of acute illness and injury but is lacking an emergency care system capable of meeting this need. The Zambian Ministry of Health has prioritized developing and strengthening their emergency care system, and a recent assessment by the WHO recognized several action priorities including developing context-relevant emergency care courses and widespread training of frontline providers. The WHO’s Basic Emergency Care (BEC) course is clinical training aimed at frontline providers (doctors, nurses, clinical officers) who by necessity provide emergency care at their facilities, but have received little or no formal training in the field.

Methods: A total of 210 health care providers were trained. In September 2017, 31 health care providers were trained in the BEC course in Kafue, and 27 providers were trained in Choma. In January and October 2018, 32 providers were trained in Kasama, 36 in Mpika, 31 in Liteta, 29 in Mpanshya, and 24 in Nyimba. Prior to the courses, data on emergency care knowledge and comfort level were collected from participants using multiple choice exams and Likert scale survey questions. This was repeated post-course, and pre-course data on emergency care knowledge and comfort level was compared to post-course data.

Results: In Kafue, pre-test mean was 62.9, post-test mean was 80.6 (p<.0001). In Choma, pre-test mean was 67.7, post-test mean was 88.0 (p<.0001). In Kasama, pre-test mean was 70.1, post-test mean was 82.4 (p<.0001). In Mpika, pre-test mean was 68.4, post-test mean was 83.5 (p<.0001). In Liteta, pre-test mean was 58.5, post-test mean was 81.3 (p<.0001). In Mpanshya, pre-test mean was 60.3, post-test mean was 82.9 (p<.0001). In Nyimba, pre-test mean was 54.0, post-test mean was 78.0 (p 0.0001).

At all sites, participant-rated comfort level with emergency care increased after the BEC training.

Conclusion: The WHO BEC training produces statistically significant improvements in emergency care knowledge in participants, and improves self-rated confidence in providing emergency care. The BEC course is a good option for training healthcare providers in the fundamentals of emergency care.

Keywords
International emergency medicine, education
Logistic Factors Affecting the Use of Ultrasound Machines by Emergency Medicine Residents

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Background: Point-of-care ultrasound (POCUS) is a standard part of Emergency Medicine (EM) residency training. Appropriate ultrasound machine (UM) maintenance is important, as dirty or missing UM machines detract from patient safety, ED flow, and the educational mission of a residency program. The purpose of this study is to explore the logistic and maintenance factors affecting the use of US machines by EM residents in the ED. Methods: An electronic survey was distributed to EM residents of a single academic tertiary care center with a four-year EM residency program. Current EM residents and the most recent graduating class were surveyed using RedCAP. Resident demographics, self-reported ultrasound use patterns and machine maintenance practices, and barriers to UM cleaning and use were collected. Each UM maintenance-based question was reported by the number of residents giving the two highest scores on a five-point Likert scale and by effect size. Results: 70 residents were surveyed; 51 replied for a response rate of 73%. 88% (45/51) were current residents and 12% (6/51) were graduates. The majority of residents (92% (47/51)) reported feeling comfortable using POCUS and 96% (49/51) use POCUS frequently during clinical shifts. 54% (27/50) of respondents knew the general location of where all the UM machines in the ED belonged, and 34% (17/50) knew the designated “parking spot” for every UM. 53% (26/49) reported they have abandoned an indicated POCUS because they could not find the UM. 36% (18/49) ordered more radiology studies because they could not find an UM. Inability to locate an UM was a frequent factor impacting the use of UM in the ED. 51% (25/49) felt they were frequently spending unnecessary time searching for an UM. Finally, 10% (5/49) felt that spending time searching for UM increases the quality of patient care. Conclusion: Inability to locate UM was identified as a significant barrier to EM resident use of POCUS during clinical shifts. Residents who could not locate an UM were likely to abandon indicated POCUS studies and to order more radiology studies.

Keywords  
Ultrasound Residents POCUS

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Mastery Multiple Choice Tests: Automatic Item Generation, Standard Setting, and Learner Performance

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Background: Mastery learning assessments have been described in simulation-based educational interventions; however, studies applying mastery learning to multiple choice tests (MCTs) are lacking. Barriers to the use of mastery MCTs include the need for large item banks, distinctions in standard setting, and deviation from traditional psychometric tendencies. The purpose of this study was to evaluate an approach to item generation and standard setting to facilitate the creation of mastery MCTs, testing the hypothesis that learners will perform consistently across versions of tests developed using this technique.

Methods: Design: Twenty item models with fields for interchangeable variables and banks of 3 to 5 isomorphic variables per field were developed by two clinician-educators. Item models were mapped to a test blueprint for an existing curriculum. The standard setting method used was a modification of Yudkowsky’s patient safety approach for skills checklists. Variables and mastery standards were established using a modified Delphi process. Intervention: Two test forms were created using the item models and randomly selected variables. Tests were administered at two residency programs during conference. Both versions were completed in one session where learners received the second test as soon as the first was completed. The primary outcome was the consistency of pass-fail decisions across versions of the test.

Results: All residents at the conference sessions (n = 47) participated in this pilot. There were no significant differences in mean learner performance across versions of the test (Version A mean: 69%, standard deviation: 10% vs Version B mean: 67%, standard deviation: 11%; p = .16). The consistency of pass-fail decisions across versions of the test was 94% (kappa = .54). Item-level consistency in learner performance across versions of test was 90% (kappa = .77, SE = .03).

Conclusions: This technique can be used to create mastery MCTs that produce consistent pass-fail decisions, broadening the range of assessment methods available to educators implementing mastery learning curricula.

Keywords  
mastery learning, standard setting, multiple choice tests, automatic item generation,
Medication recall and implications on safe prescribing in older adults who present to the ED

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BACKGROUND Thirty percent of older adults experience an adverse drug event (ADE) each year, partly because of the multiple medications they use. ED providers commonly rely on older adult patients to provide accurate accounting of their medications, usually from memory or from lists they bring to the ED or from assistance with caregivers. Inaccurate accounting of medications likely increases ADE occurrence among older adult ED patients. Our objective was to examine the accuracy of medication recall from memory and with assistance from lists or caregivers among seniors at ED presentation, factors associated with poor recall, and the drug classes most commonly implicated.

METHODS This secondary analysis of a cross-sectional study included non-institutionalized patients ³50 years old at low risk for cognitive impairment recruited from Sept. 2013 to Aug. 2014 at two urban academic EDs. Patient-reported medications were compared to pharmacy-dispensed medications as the gold standard. We examined (1) the extent of discordance between patient and pharmacy reports (from memory or with assistance from their own lists or caregivers), (2) factors associated with discordance, and (3) the most commonly discordant drug classes. We used multivariate linear models to examine demographic factors and recall methods associated with discordance. RESULTS Of the 213 participants, 56% were female, 73% white, and the median number of prescription medications was 6 (IQR 4-9). Only 47% of medications were correctly recalled by patients vs. pharmacy reports. Males were 13% more discordant with pharmacy reports than females (95%CI 3.8-21.4%). Participants who used only memory were 19% less concordant with pharmacy reports than those who used lists or multiple methods for recall (95%CI 8.9-30%). Drugs classes with the most discordance included: antibiotics (87% discordant), obstructive respiratory disease medication (72% discordant), and urological medication (58% discordant). CONCLUSION Older adults presenting to EDs often fail to recall their medication accurately which could contribute to ADEs in this population. ED providers should be aware that men and adults using memory alone are more likely to make medication recall errors. Antibiotics are the least accurately recalled drug class by seniors in this study and the most frequently implicated in ADEs nationally.

Keywords
geriatrics; seniors; adverse drug events; safe prescribing; antibiotics; cross-sectional; secondary analysis; epidemiology
Introduction
Limited research has shown that sexual minority physicians, those who are lesbian, gay, or bisexual (LGB), experience discriminatory treatment at work based on their sexual orientation. Preliminary investigations have also shown that 2-4% of graduating medical students have reported mistreatment based on sexual orientation, but the experiences of LGB medical students and how they may differ from their heterosexual peers is currently unknown. In 2016, the Association of American Medical Colleges (AAMC) Medical School Graduation Questionnaire (GQ) added questions related to sexual orientation. Our study aims to evaluate differences in interactions with faculty among sexual minority medical students compared to their heterosexual counterparts.

Methods
Data from the national 2016 and 2017 AAMC GQ surveys were included in the analysis. Means and standard deviations were calculated for questions in the Learning Environment Student-Faculty Interaction (LESFI) scale, which evaluates students’ perceptions of their educational experience and interactions with faculty on a 6-point likert scale from "Never" to "Always". Differences between LGB and heterosexual students’ responses were calculated using independent t-tests.

Results
A total of 30,651 individuals responded across two years. 1,514 (4.9%) respondents identified as lesbian, gay, or bisexual (LGB). On average, LGB students reported lower satisfaction with their medical education: 3.34 vs 2.93 for “The educational experience makes students value themselves” (p<0.001); 3.38 vs 3.02 for “The educational experience makes students feel confident of their academic abilities” (p<0.001). LGB medical students reported, on average, poorer faculty treatment: 3.72 vs. 3.43 for "Faculty give personal help with academic difficulty" (p<0.001); 3.86 vs 3.64 for "When giving criticism, faculty are genuinely interested in helping" (p<0.001).

Conclusions
LGB medical students report significantly poorer medical school experiences and faculty treatment compared to heterosexual medical students. Next steps will include examining differences in reported mistreatment and burnout between LGB and heterosexual medical students and the impact of mistreatment on burnout.

Keywords
education; sexual minority; diversity; medical student; wellness; mistreatment; discrimination
Multispecialty Consensus on Optimal Imaging for Renal Colic Using a Modified Delphi Approach

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Background
There are over 2 million Emergency Department (ED) visits for suspected renal colic (RC) in the U.S. annually. Computed tomography (CT) is accurate for diagnosis but carries a risk from radiation and has not been shown to alter patient-centered outcomes (admission and intervention). Alternative imaging approaches including ultrasound (US) may be used, but perspectives on imaging may differ by specialty. We sought consensus from a multispecialty nationally representative panel on RC scenarios where CT might be avoided. Method
Under ACEP Emergency Quality Network (eQual) we convened a nine-member physician panel including 3 ACEP representatives, 3 American College of Radiology representatives, and 3 American Urological Association representatives. The panel created 29 clinical vignettes for suspected RC scenarios in which CT imaging might not represent the optimal approach. The 29 vignettes were felt to be the best balance between possible permutations and feasibility and comprised a variety of patient age, gender, clinical presentations, and special populations. The panel selected from the following for each vignette: no imaging, point of care US, radiology performed US, reduced dose CT (RDCT), standard non-contrast CT, or CT with IV contrast. A modified Delphi approach using 3 rounds of voting was performed. Following an initial round of voting the group was provided a blinded results summary followed by a group discussion. This was repeated after the second round for final consensus. Consensus was defined by overall imaging modality (no imaging, any ultrasound, any CT), and was defined apriori as perfect (9/9), excellent (8/9), good (6-7/9), or moderate (5/9), with less than 5 indicating no consensus. Results
At the conclusion of the process consensus was perfect in 15/29 vignettes (52%), excellent in 8 (28%), good in 3 (10%), moderate in 3 (10%). No imaging was recommended for 13 clinical scenarios (45%), US for 9 (31%), and CT for 7 (24%). Conclusion
A modified Delphi approach successfully achieved consensus for all clinical scenarios and demonstrates specific situations where CT can be avoided. When needed, RDCT should be performed. These results can help guide imaging choices in specific situations where renal colic is suspected.

Keywords
Renal Colic Imaging Computed tomography Ultrasound

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Novice Echocardiographic Assessment of Tricuspid Regurgitant Jet Velocity in a Pediatric Population

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Background Pulmonary hypertension is rare in children but associated with high mortality. Cardiologists assess for pulmonary hypertension by measuring tricuspid regurgitant jet velocity (TRJV) during echocardiography. Previously TRJV has been measured by experts who are not always readily available during emergency department (ED) visits. To test the feasibility of novice sonographers to perform adequate echocardiograms to assess for TRJV pathology assessed by an expert pediatric cardiologist.

Methods We conducted a cross-sectional study in an urban pediatric ED (PED). Eight novice physician sonographers (who had performed ≤50 echocardiograms) completed a 3-hour course on how to assess for TRJV. Sonographers were asked to enroll 10-15 patients aged 7-21 years presenting to the PED. Critically ill patients, non-English speakers, and those with known pulmonary hypertension were excluded. A pediatric cardiologist, blinded to sonographer identity, rated echocardiograms as “adequate” or “inadequate” to assess for TRJV. Echocardiograms were also graded for secondary outcomes based on key elements: (1) ability to obtain a 4-chamber view, (2) use of color box, (3) optimization of TRJV, and (4) continuous wave Doppler application. We performed a test of association to identify characteristics associated with an adequate scan. We used descriptive statistics, binomial proportions, and logistical regression analysis to test outcomes.

Results Sonographers completed 80 echocardiograms. They obtained images of adequate quality to assess for TRJV 82.5% (95% CI 74.2-90.8) of the time. They obtained an adequate apical 4-chamber view in 85% (95% CI 77.1-92.9) of scans, applied color box correctly 65% (95% CI 54.5-75.5), optimized TRJV 78.7% (95% CI 69.8-87.7), and correctly applied continuous wave Doppler in 55% (95% CI 44.1-66.0). There was a statistically significant association between younger patient age and scan adequacy (p=0.043).

Conclusion Novice sonographers obtained adequate images to assess for TRJV pathology a majority of the time, although correct acquisition of specific scan elements varied. This study provides preliminary evidence that novice sonographers can perform TRJV studies, highlights echocardiogram components that were more challenging, and establishes the basis for future study of clinical applications.

Keywords Tricuspid Regurgitant Jet Velocity, Pulmonary Hypertension, Novice Ultrasonographers, Point of Care Ultrasound, Cardiac Ultrasound

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Obesity is Highly Prevalent among Patients Admitted to an Emergency Department Chest Pain Observation Unit

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Background: The prevalence of obesity is increasing in the US, with implications for diagnosis and outcomes. We sought to describe patients admitted to an Emergency Department (ED) Chest Pain Observation Unit (CPU) by body mass index (BMI, kg/m²) and compare characteristics of patients with obesity (BMI 30-39.9) and severe obesity (BMI >40) to those with normal BMI (18-24.9, reference group). Methods: A retrospective cross-sectional review of electronic health record data was performed on consecutive CPU patients (≥18 years old) with angina equivalent symptoms. The unit of analysis was the index visit for each patient during the study time period; analyses were patient-level based on first visits. Mean, median, and proportional differences (Δ) are reported with 95% confidence intervals (CI). Results: Between 01/2013-02/2018, 886,450 ED visits resulted in 7,540 CPU admissions for 7,092 patients, with mean age 55 (±12) years, 56.2% female, 82.9% non-Hispanic, 57.8% White. The distribution of BMI categories was: 20.6% normal, 33.3% overweight (BMI 25-29.9), 36.0% obesity, and 8.7% severe obesity. Compared to the reference group, patients with obesity and severe obesity patients were younger (Δ = -4.7 (CI -3.8, -5.5) and -8.2 (CI -7.1, -9.3) years) and more likely to be non-white (Δ = 10.1% (CI 6.9, 13.3) and 20.2% (CI 15.5, 25.0)). Patients with obesity were less likely to be female (Δ = -4.7% (CI -1.5, -7.9)). Those with severe obesity were more likely to be female (Δ = 9.2% (CI 4.7, 13.8) with higher rates of ≥3 cardiac risk factors (Δ = 5.9% (CI 1.2, 11.7)). Nearly all patients underwent stress tests (88.8%), the majority (56.8%) of which were myocardial perfusion Single Photon Emission Computed Tomography. Patients with obesity or severe obesity had lower proportions of treadmill tests (Δ = -3.2% (CI -0.5, -5.9) and -8.4% (CI -4.8, -12.0)) and higher proportions of Positron Emission Tomography studies (Δ = 7.1% (CI 5.3, 8.8) and 33% (CI 29, 38)). Obesity and severe obesity groups had longer length-of-stays (Δ = 0.66 (CI 0.12, 1.2) and 2.5 (CI 1.6, 3.4) hours). Conclusion: Patients with obesity represent a significant proportion of ED CPU admissions, with implications for diagnostic decisions and risk stratification. The CPU may serve as a venue for referrals for weight management in these high-risk patients.

Keywords
obesity; chest pain observation unit
Opening Up Management Strategies: Steroid Administration for Asthma in Statewide EMS Treatment Protocols

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Introduction: Asthma is a common emergency department complaint, accounting for ~1.8 million ED visits yearly in the US. Inhaled bronchodilators as well as steroids are mainstays in treatment for acute exacerbations. Research has demonstrated that early steroid administration significantly reduces hospital admission for adults as well as pediatrics, as well as preventing relapses. This benefit is greatest when administered in the first hour of ED admission. The purpose of this investigation is to describe the overall prevalence of steroid administration in asthma Statewide Treatment Protocols (STPs) and the characteristics of these protocols. Methods: Cross sectional study of STPs utilizing a standardized review of protocols for asthma, wheezing, reactive airway disease or respiratory distress. Protocol revision date was also captured. Results: Thirty four out of fifty (68%) states issue ALS STPs, ten of which serve as guidelines. IV steroids are included as an approved medication for wheezing or asthma in 24 (71%) of STPs. Methylprednisolone is the most common steroid with 23 (96%) of states including it in their wheezing protocols. Dexamethasone was included in 6 (25%) STPs, hydrocortisone was included in 2 (8%) protocols, and oral Prednisone was found in one protocol (4%). Multiple steroid options were available in eight STPs. 76% of protocols have been revised since 2015. Discussion:EMS administration of steroids for bronchospasm would serve as the earliest administration point in the emergency response system. Despite demonstrated benefit of early administration of steroids, 29% of states do not allow for EMS administration of steroids. Protocol revision cycles are unlikely to be a primary contributor as most protocols have been revised within three years. Further study is needed to examine the barriers to introduction of steroids for asthma in STPs.

Keywords
EMS, Pharmacology, Prehospital
Background: Pulmonary embolus (PE) is associated with significant utilization of health resources and financial burden. As patients can be accurately risk-stratified using validated tools, there is opportunity to select a subset of PE patients who can be safely treated without hospitalization. In addition, the use of novel oral anticoagulants (NOACs) has simplified this treatment strategy for some patients. Our aim was to describe the population, treatment strategies, short-term complications, and outcomes associated with outpatient management of PE following treatment in the ED. Methods: This retrospective health records survey investigated a 4-year cohort of consecutive patients presenting with PE who received treatment in an academic, tertiary ED and were discharged to home. Electronic and manual abstraction strategies were used, extracting data on demographics, clinical features, interventions, complications, and ED return visits within 1 month. Data were analyzed using descriptive statistics and agreement between trained abstractors was excellent (k=0.93-0.97).

Results: Data from 151 patients were analyzed (median age 56 years; range 20 to 94; 87 (58%) male). 118 (78%) were discharged directly to home, 28 (19%) were discharged following treatment in the ED clinical decision unit, and 1 patient (0.7%) left against medical advice. The Simplified Pulmonary Embolism Severity Index (sPESI) classified 99 (67%) as being at low mortality risk and 48 (33%) at high risk. Treatment with a NOAC was provided in 61 cases (61/151, 40%). Other treatments included low-molecular weight heparin in 33 cases (22%) with a bridge to warfarin in 55 (36%). By 7 days, 14 patients (14/151, 9%) returned to the ED with continued PE symptoms. 26 patients (26/151, 17%) experienced related return visits within 30 days, with symptoms including: chest pain (17/26, 65%), dyspnea (10/26, 39%), and limb pain or swelling (2/26, 8%). Of these, one experienced myocardial infarction (1/151, 0.7%) and 4 required hospital admission (3%). 6 (6/151, 4%) returned for medication-related bleeding (hemoptysis 4, hematuria 1, vaginal bleeding 1); none required admission.

Conclusion: In this cohort of ED patients with PE, outpatient management was safe and effective for the large majority. Immediate and 30-day complications and return visits were few, with only 4 patients requiring hospitalization.

Keywords
pulmonary embolism, pulmonary embolus, emergency medicine, emergency department, anticoagulation
Background: Evaluating geriatric trauma is a challenging tension between considering age-related vulnerabilities and judicious use of resources. Following consensus guidelines (full trauma team activation, liberal imaging) could subject patients to unnecessary tests, delay disposition, and gobble resources. We investigated if partial activation and focused imaging accelerated disposition without missing pathology in elderly patients on anticoagulation with isolated blunt head trauma.

Methods: This is a single center prospective trial at a level 1 urban trauma center. We implemented partial trauma team activation (Delta) in September 2016. Any patient over 65 on anticoagulation who fell from no higher than standing height within the last 12 hours was evaluated at triage by an emergency physician (EP). If that EP found stigmata of blunt head trauma without neurologic deficits, the EP expedited a CT. If there were no other findings on exam, the CT was unremarkable, and no other issues arose, the patient was discharged. Outcome measures were intracranial pathology and time-to-disposition. We compared Deltas with patients seen before September 2016 who would have met Delta criteria (Bravo) and medical patients over 65 who had CT head/neck performed (Usual Care). We compared the frequency of intracranial pathology with Fisher’s exact test and time-to-disposition with ANOVA followed by Tukey’s test. Results: We enrolled 417 patients, 154 Delta (85 ± 7 years; median ± interquartile range), 132 Bravo (82 ± 6), 131 Usual Care patients (71 ± 7). No patients were excluded. Bravos had more intracranial pathology (9/132; 6.8%) than Deltas (3/154; 1.2%) or Usual Care (3/131; 2.3%). This trend was not significant after correcting for multiple comparisons (β=0.80). Deltas went home faster (5.28 vs 8.47 hours; p<0.05) but took longer to admit (10.66 vs 8.72 hours; p<0.05) than Bravos. More Deltas than Bravos were discharged (76/154, 49% vs 50/132, 38%, p<0.05). Overall time-to-disposition did not differ (7.93 (Delta) vs 8.62 (Bravo) hours; β=0.80). Conclusion: Partial trauma team activation reduced admissions and time-to-discharge, but increased time-to-admission in geriatric isolated blunt head trauma without neurologic deficits. A larger study may provide more power for multiple comparisons and longer follow-up.

Keywords
geriatric emergency medicine, trauma, geriatric trauma, partial trauma team activation
Patient and Clinical Process Predictors of Patients Leaving Without Being Seen from the Emergency Department

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Background: Suboptimal patient flow in the ED results in patients leaving without being seen (LWBS). This compromises patient experience, safety and quality of care. Our goal was to evaluate associations between patients LWBS and 1) ED process measures and 2) patient characteristics. Methods: A case-control design compared registered patients LWBS with controls who completed evaluation and treatment. The setting was an academic 95,000 annual visit Adult ED with a baseline LWBS rate of 6.0 %. Data were drawn from two 4-week periods (15,001 total visits) in September and December 2015. Measures collected at the beginning of each hour included numbers of: 1) patients in the waiting room and treatment areas, 2) admitted ED patients boarding i.e. waiting for an inpatient bed, 3) attending physicians, nurses and resident trainees on duty. Ratios included the number of registered patients per RN, attending, and resident on duty. Inpatient and ED occupancy rates were recorded. Patient variables collected were 1) age, 2) gender, 3) race, 4) arrival mode (walk-in or EMS), and 5) ESI acuity (5-point scale). Univariable approaches to statistical analyses included t-tests for continuous data and Pearson’s chi-square for categorical data. We split the data into derivation and validation sets of approximately equal sample size. The data were split randomly and balanced on the number days from each month. We used forward selection to develop the model and any factor with a p-value £ 0.05 was retained. The model was compared to configurations of utilization variables that theoretically captured LWBS risk. The final model was selected from among these comparisons using significance testing of variables for nested models. Results: Statistically significant process measures included the numbers of patients in the 1) waiting room OR 1.078 (95%CI 1.057-1.10) and 2) treatment area OR 1.045 (1.034-1.057) (both p = 0.00). Patient characteristics associated with LWBS included 1) younger age, 2) lower acuity (higher ESI category), and 3) arrival as a walk-in (all p = 0.00). The AUC in the validation sample was 0.8335. Conclusion: Greater numbers of patients in the waiting room and inside the treatment area are associated with patients LWBS. The same is true of younger age, lower acuity and arrival as a walk-in rather than by EMS.

Keywords
Leave without Being Seen, Boarding, ED Flow
Patient Density: an Objective Measure of Long Term Emergency Department Crowding

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Background: Emergency Department (ED) crowding has been shown to harm patients and remains a major concern for patient safety in the ED. Physical ED size is a key factor in crowding. Different scoring systems have been designed to measure ED crowding such as National Emergency Department Overcrowding Score (NEDOCS) or International Crowding Measure in Emergency Departments (ICMED). However, these provide only a real-time assessment of crowding in the ED without any global sense of the severity of crowding throughout the year. NEDOCS and ICMED can vary dramatically by time of day, month of year. We hypothesized that calculating the patient contact hours per treatment space per day, which we termed, patient density, would be useful in predicting the severity of ED overcrowding.

Methods: This was a retrospective cohort analysis of 6 ED from data collected between 01/01/2017 to 12/31/2017. For each ED, patient contact hours for the year as well as the number of licensed treatment spaces were obtained. With this information we calculated the number of hours each day where a treatment space is utilized for patient care. We surveyed the chairs of each ED, using a 10 point Likert scale question, to determine how severe a problem they thought crowding to be, due to space. An ordinal logistic regression model was developed to test for association between patient density and the ED chair’s impression of ED crowding in their department. Additional covariates such as academic status and practice setting (e.g. urban, etc) were also included in the model.

Results: The survey had 100% response rate with all 6 chairs responding. The patient density ranged from 3.5 to 21.8 patient hours per space per day. The ED chairs crowding scores ranged from 3 to 9. The ordinal logistic regression model yielded a Pearson chi-square test of 5.4 which results in a p-value of 0.019. Academic status and practice setting were not associated with ED crowding due to space.

Conclusion: We sought to develop an objective metric to quantify the long term severity of overcrowding in ED. Patient density is easily calculable from metrics that are routinely obtained. The results of this study suggest that patient density is associated with a chair’s judgement of ED overcrowding. This allows for numeric and objective comparisons with other hospitals and can be used to advocate for additional resources to hospital administration.

Keywords:
crowding, boarding, throughput, space
Pedestrian Fatalities in the U.S: Trends and Demographic Disparities

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Background: In 2016, motor vehicle traffic (MVT) deaths to pedestrians in the U.S. were the highest they have been in over 25 years. Pedestrian traffic deaths represent an increasing proportion of all traffic deaths nationally. We examine the details of this trend and explore demographic disparities to inform future research and prevention.

Methods: The Centers for Disease Control and Prevention’s Web-based Injury Statistics Query and Reporting System (WISQARS) was used to generate counts, rates and trends in unintentional pedestrian deaths in motor vehicle traffic among U.S. residents by age subgroups, sex, race, Hispanic ethnicity, and geographic region and urbanization of residence for 2007 through 2016. Comparisons are made with trends in national estimates of nonfatal MVT pedestrian injuries using WISQARS and the Agency for Healthcare Research and Quality's HCUPnet query system.

Results: After a period of initial improvement from 2007 to 2009, age-adjusted MVT pedestrian death rates increased 44% from 2009 through 2016. Death rates during this period increased in both males (45% increase) and females (35%), Hispanics (25%), white non-Hispanic (NH) (48%), black NH (46%), and American Indian/Alaska Natives (AIAN) (41%), among residents of metropolitan and non-metropolitan areas, and all age groups except those 0-14 years. Western, Southern and Midwestern states experienced greater increases (54%, 42% and 41%, respectively) than the Northeastern states (26%). Significant disparities exist by race, gender and age group. In 2016, individuals over 50 years of age had the highest rates, with those 80-84 years of age having nearly twice the overall rate. AIANs had the highest death rate of all racial/ethnic groups in 2016, with a rate 3.5 times that of whites. The states with the highest average annual death rates for the 3 year period 2014-2016 were New Mexico, Florida, Louisiana; lowest rates were seen in Vermont, Minnesota, and Nebraska. In contrast, rates of nonfatal MVT pedestrian injuries have not increased.

Conclusions: The large increases in MVT pedestrian death rates seen in recent years have occurred in nearly all demographic groups. Further research into the causes and contributing factors of this trend and the disparities in these deaths is warranted. Additional research is needed to explain the trend differences in fatal and nonfatal events.

Keywords
pedestrian; injury; epidemiology
Pediatric Mental and Behavioral Health Emergencies: A Qualitative Study of Providers’ Experiences and Challenges

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Background: Pediatric mental and behavioral health visits to Emergency Departments (ED) have increased dramatically. Yet almost no research has explored providers’ experiences with these patients, the specific challenges these patients present, and ways to manage challenges. We sought to gain a deeper understanding of these issues to inform interventions aimed at improving patient and provider experiences.

Methods: We conducted one-on-one semi-structured interviews with ED providers who treat pediatric patients in 2 academic and 4 community hospitals. Providers were asked to describe their experiences with pediatric mental and behavioral health patients and challenges treating them. Providers also shared perceptions of the causes of the increase in these visits, and ways to manage challenges. Interviews were audio-recorded, transcribed, and coded by 2 research team members in accordance with Grounded Theory methodology. Results: 26 ED providers (13 attending physicians, 13 registered nurses) participated. Providers frequently expressed frustration, resentment, and sadness in response to pediatric mental and behavioral health patients, with anger often targeted at patients’ parents/caregivers. This anger reflected the most frequently cited cause of visits, which was poor parenting/caretaking. Failures of other systems were also cited for visits, including policies at schools and residential facilities. Most providers perceived at least some visits to be unnecessary, which contributed to negative reactions. Three broad themes emerged regarding challenges with this population: (1) diagnostic and treatment challenges (e.g., ED is not a therapeutic environment, providers feel unable to provide effective treatment), (2) behavior challenges (e.g., aggression, staff need for de-escalation training), and (3) resource challenges (e.g., patient boarding, time-intensive nature of caring for these patients). To better manage patient well-being during often lengthy stays, some providers described efforts to create structured daily schedules for patients.

Conclusion: ED providers report significant challenges treating children with mental and behavioral health conditions. More research and support is needed to help ease these challenges, which will likely improve patient and providers’ experiences and patient outcomes.

Keywords
mental health, behavioral health, pediatric patients, qualitative research
Performance of SOFA Score to Predict Mortality at Hospital Discharge After Cardiac Arrest

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Background: Cardiac arrest (CA) outcomes, often dichotomized as survival/non-survival, limit statistical power of interventional studies and do not acknowledge hospital-level factors independent of post-CA sequelae. We explored the utility of the Sequential Organ Failure Assessment (SOFA) score at 72 hours post-CA to predict mortality. We also assessed methods to account for death.

Methods: This was a single center retrospective study of post-CA patients from 1/08-12/17. SOFA score components were abstracted at baseline, 24, 48, and 72h post-CA. Thirteen ways of accounting for missing data were assessed. The outcome was mortality at hospital discharge. Model performance was assessed using area under the receiver-operator characteristic (AUC) curves and Hosmer-Lemeshow goodness of fit statistics.

Results: Of 847 patients, 528 (62%) had complete baseline SOFA scores and 205 (24%) had all elements at 72h. Death within 72 hours occurred in 28%; 45% survived to hospital discharge. SOFA score at 72h without accounting for death had an AUROC of 0.62. The best performing SOFA model at 72h with good calibration imputed a 20% increase over the last observed SOFA score in patients who expired.

Conclusions: Without consideration of death, SOFA scores at 72 hours post-CA perform poorly. Imputing for early mortality improved the model. If this imputation structure is validated prospectively, SOFA could provide a scoring system to predict death at hospital discharge and serve as a surrogate outcome measure in interventional studies.

Keywords
cardiac arrest, epidemiology, outcomes, mortality
Pilot Study of Patients with Suspected Renal Colic: Is Shared Decision-Making Desired, Appropriate, and Feasible?

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Background: Kidney stones are common, painful and costly. Because CT scans are the most frequently used diagnostic modality, young patients with renal colic are often exposed to radiation during the course of their ED visit. We sought to prospectively evaluate whether clinical characteristics (such as fever) were associated with the receipt of an emergent or urgent intervention (such as lithotripsy or surgery) in young patients, and therefore could be used to risk stratify prior to the decision regarding CT use. Additionally, we sought to identify whether patients with suspected renal colic would be interested in shared decision-making around imaging options.

Methods: This prospective cohort study enrolled patients ages 18-50 who were suspected of having renal colic by their ED clinician. Data regarding patient and clinical characteristics and patient preferences was collected directly from patients, clinicians, and the medical record, and data regarding outcomes was collected directly from patients. The primary outcome was the need for a surgical intervention or admission within 72 hours. Secondary outcomes included desire for shared decision-making, ED return visits, and surgical procedures performed within 6 weeks of the ED visit.

Results: Over a 2-year period we enrolled 190 individuals. 52.6% were female and 74.2% were white. The majority had a CT scan on their first visit (127, 66.8%) and 80 (42%) had an ultrasound (US). Twenty-four (12.6%) were admitted and 8 (4.2%) had a urologic intervention during their initial admission. Overall, 102 had one of the following concerning clinical features: Stone Score of 0-5, signs of infection, heart rate greater than systolic blood pressure, admitted to the hospital, or moderate or severe abdominal tenderness. Of those who had one or more features, 28 (27.2%) had a procedure or admission within 72 hours and 58 did not (17 LTFU). Of those with no concerning clinical features, the rate of admission/procedure was 6 (6.9%) and 53 did not (28 LTFU). When asked about shared decision-making 136 of 182 (75%) wanted shared decision-making.

Conclusion: High-risk clinical characteristics did predict need for admissions and emergent surgical procedures and could be used to risk stratify prior to a decision about imaging. Despite presenting with acute pain, the majority of patients wanted shared decision-making.

Keywords  
Renal Colic, Emergency Department, Ultrasound, Quality improvement, Clinical Decision Making
Point-Of-Care Ultrasound to Evaluate Pulsus Paradoxus in Children with Asthma

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Background
Pulsus Paradoxus (PP) is defined as a fall of systolic BP of >10mmHg during the inspiratory phase of respiration. Measurement of PP is recommended by asthma guidelines as an objective measure of asthma severity but rarely used in clinical practice. Point-of-care ultrasound (POCUS) with pulse wave Doppler measuring respiratory-phasic changes of mitral valve (MV) inflow velocities is well described in cardiac tamponade as a "sonographic" PP in the apical 4-chamber view of the heart. Biventricular interdependence has an important role in both pericardial tamponade and asthma. The objectives of the study were: 1) to measure the degree of PP detected by POCUS in children presenting to an ED with acute asthma, 2) compare PP in asthma to healthy age-matched controls and 3) to measure the changes in PP after standard asthma therapy.

Methods
A prospective convenience sample of 16 children with acute asthma were compared to 16 age-matched controls. Patients with asthma were evaluated at presentation and 2-3 hours after therapy. Using a phased array probe, an apical 4-chamber view of the heart was obtained. The pulse wave marker gate was placed inside the left ventricle and activated at the tip of the MV leaflets. The MV inflow velocities were observed over several respiratory cycles and largest and smallest early filling signals (E-waves) measured during inspiration and expiration and the difference calculated as a percentage (Emax-Emin/Emax). Results
The mean age of 16 patients with asthma was 8.5 (6.5-10.5) years. 87.5% had a PMH of asthma, 12.5% prior intubation, 56% prior admission and 16% a prior ED visit in the last 12 months. Mean Spo2 was 95% (93-97), and RR 32 (24-40). 10 were discharged (62.5%) and 6 admitted (37.5%). The mean PP detected by ultrasound in the asthma group was 20% (15-25%) compared to age-matched controls of 9% (7-11%) (p=.001). After asthma therapy, the mean PP in all asthma patients decreased from 20% to 13% (p=0.014).

Conclusion
Measurement of PP via POCUS identified all cases of asthma compared to age-matched controls. PP decreased significantly after asthma therapy in all asthmatics. Future studies evaluating the potential contribution of POCUS and PP for assessment of acute asthma should be performed.

Keywords
Point-of-care ultrasound, Pulsus Paradoxus, Asthma, Mitral valve
Background: When providers feel aversion toward patients, medical errors and poor patient care can ensue. Elucidating the causal chain that results in aversion may present opportunities for mitigation. Little research has been done on this topic. In a collaboration between psychology and emergency medicine (EM) researchers, we tested the hypothesis that emotional priming can influence providers’ feelings about psychiatric patients. Methods: We randomized EM providers to one of 2 priming conditions in a computerized experiment. Conditions were created by having participants write about 2 patient encounters. In condition 1, providers first recalled an encounter that elicited anger, and then, satisfaction. In condition 2, the order was reversed (satisfaction then anger). All participants then recalled an encounter with a psychiatric patient. Our main outcome is the expressed negativity in the psychiatric encounter, as determined by the preceding encounters. We measured implicit emotions using linguistic text analysis, which yields an index of emotional tone from 0 (negative) to 100 (positive). Data were analyzed using mixed-design analyses of variance. Results: 93 providers (49 attending physicians, 44 registered nurses) from 29 EDs completed the study. The recall tasks were effective in eliciting emotions, with mean emotional tone in angry encounters (14.8, 95%CI 11.0-18.6) and psychiatric encounters (20.4, 95%CI 15.6-25.3) more negative than in satisfying encounters (62.6, 95%CI 56.6-68.7), p<.001. For nurses, emotions elicited in the encounter that immediately preceded the psychiatric one transferred to the psychiatric patient, with more negative emotions following recall of an angry encounter (12.3; 95%CI 1.1, 23.4) than a satisfying one (30.30, 95%CI 19.1-41.5), p<.05. For physicians, emotions elicited in the first encounter transferred to all subsequent encounters (including the psychiatric one) with more overall negativity when an angry encounter was recalled first (30.8, 95%CI 25.9-35.8) vs a satisfying one (36.93, 95%CI 31.6-42.2), p<.10. Conclusion: Results demonstrate that EM providers’ emotions in one patient encounter may influence their emotions in later encounters. This finding opens up avenues for future research to identify interventions to reduce possible biases, mitigate error, and improve patient satisfaction.

Keywords
Patient Safety, Emotions, Emotional Bias
Predicting Outcome After Out of Hospital Cardiac Arrest: Lactate, Need for Vasopressors, and Cytochrome c

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Background: Early prediction of outcome after out of hospital cardiac arrest (OHCA) is difficult. Previous work indicated that the combination of lactate and the need for vasopressors may stratify patients and predict outcome. We hypothesized that lactate and need for vasopressor support in the immediate post-arrest period would predict outcome, and addition of a biomarker to reflect mitochondrial injury would enhance performance of the tool.

Methods: To validate previous retrospective findings, we conducted a prospective observational study of all OHCA (age >18, non-traumatic) patients presenting to the Emergency Department of an academic medical center June 2007 to December 2015 with return of spontaneous circulation (ROSC). We conducted univariate and multivariate logistic regression.

Results: Patients were divided into groups based on two variables: 1) vasopressor status (receipt of vasopressors vs. no); and 2) initial blood lactate (categories: lactate <5 mmol/L, 5 to 10, >10). 352 OHCA patients with ROSC were evaluated; 260 had a lactate measured within 3 hours of ROSC and were included in the analysis. Median age of the cohort was 65 (IQR: 53-78); 73% underwent targeted temperature management. The overall in-hospital mortality for the cohort was 60%. Patients on vasopressors had significantly higher mortality compared to patients who did not receive vasopressors (72% vs 40%; p<0.001). A stepwise increase in mortality is associated with increasing lactate (43% lactate <5, 65% 5 to 10, and 84% >10; p<0.001). Multivariable models with lactate group and vasopressor use as predictors demonstrated excellent discrimination (AUC 0.73 [95 CI: 0.67-0.79]; when adjusted for additional covariates: AUC 0.81 [95 CI: 0.75-0.86]. 37 patients had cytochrome c levels available for inclusion. In these 37 patients, comparing the models with and without cytochrome c, there was no significant difference (AUC 0.89 [95 CI: 0.77-1.00] vs AUC 0.86 [95 CI: 0.74-0.98], respectively; p=0.36). Conclusion: In this validation of previous findings, the combination of lactate and vasopressors in the immediate post-arrest period is predictive of mortality. Cytochrome c offered minimal additional predictive power but may have been limited by the small number of subjects with measured cytochrome c levels relative to the entire cohort. Multicenter validation of this tool is warranted.

Keywords
post cardiac arrest

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Introduction: Excited delirium and the spectrum of behavioral emergencies present unique challenges and dangers for EMS providers. These situations include a serious risk of injury to both EMS providers and the patients who require restraint. Deescalation techniques as well as physical and chemical restraints are the mainstays of out of hospital treatment and stabilization of behavioral emergencies. The purpose of this investigation is to describe the options for and inclusions of behavioral emergency protocols and more specifically chemical restraint in statewide treatment protocols (STP). Methods: Cross sectional study of STPs for inclusion of behavioral health, psychological emergency or excited/agitated delirium protocols. Protocol revision date was also captured. Results: Thirty four out of fifty (68%) states issue ALS STPs, ten of which serve as guidelines. 3 of these states have no protocol for behavioral emergencies or agitated delirium. A single state has a protocol but includes no medications/chemical restraints. Benzodiazepines are the most common chemical restraint, with 28 states (93%) including at least one drug from the class in their protocols. Haloperidol is the next most common with 23 states (77%) including it in their protocols. 19 states (63%) allow for IM Ketamine and IV Ketamine is included in 8 (27%) protocols. Diphenhydramine is included in 3 protocols (10%) and single states (3%) also include Zyprexa, Geodon and Droperidol. 73% of protocols have been revised since 2015. Discussion: Behavioral emergencies and agitated delirium situations present very high risk conditions for both EMS and their patients, with very high mortality and injury rates. Gaining control of dangerous situations is of paramount importance to provide the safest transport possible. Most, although not all, states provide a protocol for behavioral emergencies, but there is a very large amount of variation among the medications which can be utilized for chemical restraint. This provides an opportunity for standardization as well as examination of best practices. Further study is needed to examine the barriers to introduction and optimization of medication management in behavioral emergency STPs.

Keywords
EMS, Excited Delirium, Operations, Pharmacology, Provider Safety
Providers Prefer eAlert Plans Over Prescription Drug Monitoring for Prescribing Information

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Background
In response to the national opioid crisis, Massachusetts enacted legislation requiring emergency department (ED) providers search an online database (PDMP) before prescribing opioids. The PDMP is a pull alert; providers must navigate the website and enter information to retrieve data. In contrast, electronic alerts (eAlerts) are notifications with recommendations for patients with frequent ED visits that are automatically “pushed” when the medical record is opened. Research has demonstrated a significant reduction in opioid prescriptions in patients with a pushed eAlert. Our study evaluates ED providers’ experiences using eAlerts compared with the PDMP as well as the perceived impact on care in ED patients whom providers are considering discharge opioids.

Methods
An anonymous survey evaluating providers’ experiences using eAlerts and the PDMP for patients discharged with an opioid was created. The survey was piloted and modified for clarity and content by ED physicians not involved in the study. The survey was administered electronically via REDCAP to sixty-nine attending physicians and advanced practitioners at a single urban teaching hospital which had employed eAlerts and PDMP. Data was analyzed using simple descriptive statistics. Thematic analysis was used to categorize open-ended questions. Results
Sixty participants (86%) responded to the survey, including 48 of 54 attending ED physicians and 12 of 15 advanced practitioners. 80% reported they used both the PDMP and the eAlerts, 7% used only the PDMP, and 13% reported using neither. The eAlerts rated easier to access (median score 75 vs 37, p<0.001) and more helpful in directing care (median score 72 vs 55, p<0.001). ED providers frequently stated that the eAlert being “pushed” to them had the biggest impact on improving care with minimal interruptions. Difficulties cited with using the PDMP included technical difficulties accessing the site and lack of up-to-date information.

Conclusions
ED providers preferred the pushed eAlert system to the pulled PDMP for its ease of use and minimal interruption to workflow. Although the implementation of eAlerts for all patients is not feasible, our study offers insight into improvements that may be incorporated into future versions of the PDMP that would improve ease of use for ED providers.

Keywords
electronic alert PDMP opioid prescriptions
Public Health Students’ Role in a Pediatric Emergency Department Health Promotion Advocacy Program

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Background: The Pediatric Emergency Department (PED) Health Promotion Advocacy Program (HPAP) at Boston Medical Center was initiated in 2015 to help adolescent patients identify the intrinsic motivation for behavior change, and to connect them with community resources that address social determinants of health related to their self-identified concerns. This study describes a new role for Masters of Public Health students in the PED.

Method: Two MPH interns were trained to screen, intervene and negotiate referrals for high risk behaviors (e.g. sexual and mental health, substance use, safety) and placed in an urban PED (2-11/2018). Positive screens triggered a non-judgmental conversation that included specific health information, medical referrals to support behavior change, and community referrals for assistance with environmental challenges (e.g. housing, food insecurity, employment readiness). MPH interns added questions about perception of sexual risks to an existing HPAP Health and Safety Needs Survey in order to improve the safe sex component of the conversation. RedCap® was used for entry of anonymous data. Descriptive analysis was performed using SPSS v25. We report here on a convenience sample of 127 patients aged 13-21 (IRB exempt status).

Results: Among 127 patients screened, 68.5% were female; 35.6% Hispanic; 48.0% Black, Asian 4.7% and 10.2% white. The mean age was 18.5, and 63% were sexually active. Among those who were sexually active, only 46.0% had ever used birth control, and only 21.2% used condoms ‘always’ or ‘most of the time’. The largest barrier to condom use was partner preference. Questions about risk were added toward the end of the study period. Among the sexually active, 88.4% (n=43), perceived little-to-no risk of an STI, and 96.7% perceived little-to-no risk of unintentional pregnancy (n=30). Conclusions: Despite considerable knowledge about high STI risk and unintended pregnancy outcomes following unprotected sex, adolescents often perceived themselves to be at low risk of experiencing adverse outcomes. Although results are limited by small sample size and convenience design, this finding suggests the importance of addressing the discrepancy between actual and perceived risk in the clinical encounter. Public Health student interns can serve as valuable interdisciplinary partners in a busy, urban PED.

Keywords
Public Health Promotion; Adolescents; Sexual Health Risk. Pediatric Emergency Department, Social EM
Public Perception Towards Performing Bystander Cardiopulmonary Resuscitation

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Background: Bystander cardiopulmonary resuscitation (CPR) after out-of-hospital cardiac arrest (OHCA) improves survival and neurological outcomes. Unfortunately many OHCA victims do not receive bystander CPR during a witnessed arrest. It is known that gender disparities play a role with lower rates of bystander CPR in women suffering OHCA in public places. Our aim was to identify potential factors influencing the decision to perform bystander CPR.Methods: Participants at CPR training events were surveyed prior to training. Using different scenarios, subjects were asked about their comfort level performing CPR on female, geriatric, and pediatric victims. Anonymous responses were collected and transformed into categorical variables by a psychometrist.Results: Of the 677 participants approached, 585 (86.4%) responded to the survey, with 87.5% between 18-29 years of age, 58.8% without prior CPR training and 93.3% without prior CPR experience. Reasons to hesitate starting bystander CPR in women included concern about exposing the victim (12.9%), being accused of sexual assault (6.1%), and possible pregnancy (6.5%). In participants with prior CPR training, 61.1% reported concerns about performing CPR on women, with 18.9% having concerns about performing chest compressions in relation to breast location. In participants without prior CPR training, 73.2% reported having concerns about performing CPR on women. Causing injury and exposing the patient were top concerns to perform CPR in women amongst participants who were uncomfortable (30.5% and 17.5% respectively) and comfortable (14.5% and 9.8% respectively) performing CPR in public. Causing injury was the top concern in performing CPR on geriatric (45.4%) and pediatric patients (41.7%), followed by fragility (18.1% and 10.2% respectively). Lack of skills to perform CPR on children was reported in 22% of CPR-trained participants.Conclusion: Public perception of OHCA victims influences willingness to perform bystander CPR. Factors such as age, gender, fear of injury, pregnancy status and sexual assault concerns can negatively impact this lifesaving intervention. Awareness of the importance of bystander CPR on any cardiac arrest victim must be improved.

Keywords  
cardiopulmonary resuscitation, bystander CPR, out-of-hospital cardiac arrest, cardiac arrest, CPR, chest compressions, neurological outcome
Background: Each year 1.7 million people are diagnosed with sepsis in the USA. A putative target to prevent systemic inflammatory response syndrome is via antagonism of toll-like receptors 2 and 4 (TLR2/TLR4) in vascular endothelial cells. Proteoglycan-4 (PRG4) is a mucinous glycoprotein that interacts with CD44 and TLR4 resulting in a blockade of the NLRP3 pathway. We hypothesized that endothelial cells induced into a sepsis phenotype would have less IL-6 expression after rhPRG4 treatment in vitro.Methods: 1) Human lung microvascular endothelial cells (HLMVEC) were seeded into multi-well plates and at 80% confluence were treated with 250 ng/mL LPS-EK (InvivoGen). Three groups were subsequently treated with rhPRG4 (50, 100, 150 µg/mL; Lubris) after 30 mins. Cells were incubated for 24 hrs at 37°C. IL-6 levels in cellular media were measured via ELISA (Abcam). RNA was collected, reverse transcribed into cDNA and used for qPCR analysis with primers for IL-6 and 18S. 2) HLMVEC were treated with 1:10 diluted plasma from 15 sepsis emergency department patients in culture media. After 30 mins, either 50 or 100 µg/mL rhPRG4 was administered. Cells were incubated at 37°C for 24 hrs. IL-6 levels in cell media were measured as above. ANOVA was used for statistical analysis with Tukey post-hoc comparison. qPCR results were determined via delta-delta Ct analysis. Patient sample collections were approved by the Institutional Review Board. Results: 1) HLMVEC treated with LPS had significantly increased IL-6 protein levels (2733 pg/mL) compared to controls (277 pg/mL) (p <0.0001). All concentrations of rhPRG4 significantly reduced IL-6 (566, 348, 242 pg/mL) (p <0.0001). There was no significant change in IL-6 levels in cells treated with rhPRG4 alone. IL-6 gene expression was significantly increased after LPS treatment (p <0.05) compared to controls. This response was reversed by 50 or 100 µg/mL rhPRG4 (p <0.05). There were no significant changes in IL-6 gene expression in cells treated with rhPRG4 alone. 2) 47% and 33% of the cells treated with patient plasma had significantly (p <0.05) reduced protein levels of IL-6 in the cellular media in the presence of either 50 or 100 µg/mL rhPRG4. Conclusion: rhPRG4 significantly reduces IL-6 protein levels and gene expression after a septic phenotype is induced in human endothelial cells via LPS or septic patient plasma.

Keywords
sepsis, TLR4, IL-6, cytokine, inflammation, rhPRG4, CD44, NLRP3, endothelial
Reliability of a Bayesian Algorithm to Predict Acute Coronary Syndrome in the Emergency Department

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Background – Chest pain is one of the most common chief complaints of patients presenting to the emergency department. According to the Emergency Severity Index (ESI), a triage process used by the majority of emergency departments in the United States, patients who present with chest pain and do not require life-saving interventions are assigned a triage level of ‘2’. However, there is no standardized triage process for risk-stratifying these patients. Our study aims to evaluate the reliability of an original algorithm to identify patients at low risk for ACS. Methods – The study is a retrospective, cross-sectional analysis of an evidence-based algorithm that was developed using binary questions (i.e., yes or no) that can be answered by patients during the triage process. 363 patients were enrolled and included patients who presented to the emergency department with a chief complaint of chest pain and were assigned a triage level of ‘2’ from August 1, 2018 – August 31, 2018. The study was conducted at Hartford Hospital, a large, urban, tertiary medical center in Hartford, Connecticut. Medical records were analyzed to predict patients’ answers to the questions included in the algorithm. These answers were processed by the algorithm and a posttest probability was generated using Bayesian statistics. Posttest probabilities greater than 0.02 were considered positive results and those 0.02 or less were considered negative results. These results were then compared to whether or not patients were diagnosed with ACS. Results – The prevalence of ACS was 0.20. The sensitivity and specificity of the algorithm were 94.6% (95%CI 86.0–98.3) and 65.1% (95%CI 59.2–70.5), respectively. The positive predictive value (PPV) and negative predictive value (NPV) were 40.9% (95%CI 33.6–48.7) and 97.9% (95%CI 94.4–99.3), respectively. The positive likelihood ratio (LR) was 2.7 (95%CI 2.3–3.2) and the negative LR was 0.08 (95%CI 0.03–0.22). Conclusion – Among patients presenting to the emergency department with chest pain, our algorithm was effective in identifying patients at low risk for ACS. As such, there is an opportunity to use our algorithm during the triage process to divert patients who are at low risk for ACS to emergency department “fast track” units, which could decrease length of stay and physician workload.

Keywords
Triage
Rescheduling Hydrocodone Was Not Associated with Changing Trends of Prescribing by Emergency Physicians

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Background: In October 2014, as one response to the opioid epidemic, the Drug Enforcement Administration changed hydrocodone from a schedule III to a schedule II medication. The policy change increased restrictions for prescribing hydrocodone and was intended to inform prescribers of its high potential for abuse. We aimed to study the effect of the rescheduling on hydrocodone prescribing by emergency physicians. Methods: Retrospective analysis from the Ohio Prescription Drug Monitoring Program, which contains all of the prescriptions for scheduled medications dispensed in the state, regardless of payer. Prescriptions were included for all providers who had a primary specialty determination of “emergency medicine” for every prescription they wrote throughout the study period. We conducted an interrupted time series analysis using data on monthly counts of opioid prescriptions that were filled in Ohio between October 2011 and November 2017. The pre-policy period was 37 months before and the post-policy period was 37 months after the schedule change. Results: There were 2,257,678 prescriptions written by emergency physicians (1,445,346 pre vs. 812,322 post, a percent change of −43.8%) for 9 most commonly prescribed opioids. Hydrocodone was the most prescribed opioid by emergency physicians: 1,182,989 prescriptions (770,445 pre vs. 412,544 post, a percent change of −46.5%). Prescriptions were decreasing by −274.5/month (95% CI -333.4 to -215.6) before the policy; the interrupted time series analysis revealed that there was no additional effect associated with the policy change beyond the pre-existing secular trend. There was a nonsignificant increase in level post-policy: 804.5 (95% CI -760.6 to 2369.5) prescriptions. The added change in trend in the post-policy change was -23.2/month (95% CI -81.2 to 34.7). Conclusions: Hydrocodone prescriptions by emergency physicians in Ohio were decreasing markedly prior to its schedule change from III to II. The schedule change was not associated with an additional decrease beyond the secular trend, suggesting that the policy change did not affect emergency physician prescribing of hydrocodone.

Keywords
opioidshydrocodenepolicyprescribing
Resident Perceptions of the Annual In-Training Exam in Emergency Medicine

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Background
The American Board of Emergency Medicine In-Training Exam (ABEM ITE) is provided annually for every resident at ACGME-accredited Emergency Medicine (EM) Residency Programs across the country. Performance on the ITE has been shown to correlate to passing scores on the ABEM qualifying exam for board certification. The emphasis that EM residency programs place on ITE preparation varies considerably, as do resident attitudes toward the exam. To date, few studies have examined resident views toward the ITE. Here we describe resident perspectives on the significance and preparation habits for the annual ITE at our institution.

Methods
EM residents in our four-year, urban trauma center were surveyed on attitudes toward the ITE. Residents were provided an anonymous electronic survey and the data was analyzed via qualitative and quantitative methods.

Results
28 EM residents participated in the study, 21 from the PGY2-4 level. 16/28 (57.14%) agreed it was important to do well on the exam, while 9/28 (32.14%) felt neutral and 3/28 disagreed (10.71%). The majority of residents agreed that performance on the ITE correlates to success on the ABEM board exam (20/28; 71.43%), while only 7/28 (25.00%) agreed that the ITE was an accurate assessment of their Emergency Medicine knowledge. Additionally, residents felt that the Residency Program did not prepare them enough for the ITE (17/28; 60.71%), and would prefer dedicated didactic time be reserved for exam preparation (22/28; 78.57%) that focused on question-based review (18/28; 64.29%).

Conclusions
Residents in our cohort study recognize that ITE scores can predict success on the board certification exam in EM, but perceive that the ITE does not accurately reflect their current knowledge of Emergency Medicine. Study participants believe that our program did not prepare learners appropriately for the ITE, and that our weekly didactic conferences would be a good time for preparation and instruction. Residents in our study prefer question-based methodologies both in independent study and group review. Our data suggest that EM educators need to design an educational intervention to help residents prepare for the ITE. Any such intervention could provide residents an efficient means to prepare for the ITE amidst the competing demands of residency training.

Keywords
Education, Residency, In-Training Exam preparation
Self-Reported Barriers to Healthcare for Patients with Limited-English-Proficiency in Emergency Department

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Background: Foreign-born individuals living in the United States face many barriers to accessing healthcare; these challenges may result in significant health disparities. This study seeks to expand on prior work done attempting to elucidate the major barriers to receiving healthcare for immigrants, refugees, and other limited English proficient (LEP) patients in the Emergency Department (ED): a place where many of these patients first access the U.S. healthcare system. Previous studies have shown that linguistic barriers play an important role in patient satisfaction and use of the ED. In an effort to ensure accessible and quality care for patients who use the ED as their primary source of healthcare, the authors expanded the languages surveyed to further elucidate barriers to healthcare immigrants, refugees, and other LEP patients face when accessing and utilizing emergency care.

Methods: A total of 87 study participants who met the eligibility criteria and utilized formal (professional interpreter services) or informal (family members/friends who accompanied them) interpreter services during their current ED visit self-administered a translated survey or were administered a survey by research assistants. Results: The survey was completed by patients from 8 countries, speaking 8 languages, with the most common language being Spanish (65%). As was found in previous studies, the majority (78%) of patients preferred in-person professional interpretation over telephone/video or family member/friend. The top 3 barriers that participants expressed high concern about were: “concern about paying the bill” (21.8%), “concern about wait time” (20.7%), and “belief that professional care probably would not help” (17.2%). Among participants who expressed high concern for these 17 barriers, a majority of individuals were from the Dominican Republic.

Conclusion: Results from this survey confirm that financial barriers remain the primary barrier to health care for LEP patients with 8 native languages, followed closely by concern for wait time. These barriers may be mitigated by providing financial counseling options, as well as prioritizing the use of professional in-person interpreters whenever possible.

Keywords
Limited English Proficiency, Interpreter Services, Health Policy
Society for Academic Emergency Medicine Simulation
Academy Core Faculty in Simulation Survey

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Background
In 2018 the Accreditation Council for Graduate Medical Education program requirements for Emergency Medicine (EM) included proposed changes to a requirement for specific “protected” time to support core faculty teaching and research. Simulation-based education (SBE) is one activity for which an EM core faculty may have protected time. Data is lacking on the time spent on SBE by faculty. The objective of this survey was to engage established national networks of educators to understand current practices supporting SBE, gather opinions regarding the impact of protected time changes on SBE, and rapidly convey this information to decision makers regarding this proposal. Methods The Society of Academic Emergency Medicine (SAEM) Simulation Academy Executive Committee developed an 11-item descriptive survey on protected time, time allocation, and productivity. The survey was distributed via email to simulation faculty members of the SAEM Simulation Academy, Society for Simulation in Healthcare Emergency Medicine Section and the Council of EM Residency Directors. Survey data was gathered over two weeks. Results
There were 122 responses, of which 81% were core faculty. The majority of respondents (66%) report that their programs devote between 15-25% of resident educational time to SBE. Most faculty (66%) indicated they received >5% protected time for SBE. Seventy percent of respondents spend between 15-50 hours each month on planning SBE, with 63% also spending >10 hours on other resident education tasks. Respondents report academic productivity, with 88% reporting one or more publication and 32% reporting >5. The majority of respondents (88%) indicated that it was “extremely important” for faculty involved in SBE to have protected teaching time and 90% “strongly agreed” that “losing protected time would impact my ability to teach residents with simulation.” Conclusion
SBE now represents a significant portion of EM resident training. Faculty report a large time investment into SBE for their programs and do receive protected time for this effort. Survey respondents felt strongly that a reduction of simulation faculty protected time would negatively impact their ability to teach using simulation. This survey data was rapidly gathered and provided to SAEM to assist in advocacy around the proposed changes.

Keywords
Education Simulation Advocacy Resident
Sonographic Diagnosis of Adult Bowel Intussusception Using a Novel Sonographic Scanning Approach-A Case Series

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Background: Bowel intussusception is an underappreciated cause of acute abdominal pain in adults. Prior data suggests an annual incidence of only 2-3 per 1,000,000, but in recent years, advancements in multi-detector computed tomography (MDCT) have increased our detection rate, including patients with transient or non-obstructive intussusception. This suggests a potentially significant subset of previously undiagnosed patients. MDCT is considered the imaging modality of choice in adults. Ultrasound is the imaging modality of choice in children, but not yet frequently utilized for adults. Given that intestinal ultrasound is now included as one of the main point-of-care ultrasound (PoCUS) indications for emergency physicians (EPs), diagnosis of bowel intussusception in acute undifferentiated abdominal pain using PoCUS should increase. Methods: We present a series of three patients with enterointeretic and enterocolic intussusception diagnosed with PoCUS. We describe classic sonographic findings and report a structured scanning approach for EPs using PoCUS. Results: Three patients presenting with undifferentiated abdominal pain underwent structured POCUS: 1. Initial biliary, aortic, renal, and pneumoperitoneum PoCUS was negative. 2. Systematic scanning of gastric, jejunal, ileal and colonic structures revealed no ileus, colitis or appendicitis/diverticulitis. A bowel segment in each patient with thickened wall, double-lined bowel layers and ceased peristalsis was identified. The first and second patients were diagnosed with enterointeretic, the third with enterocolic intussusception. MDCT imaging supported the PoCUS findings. The first patient reported resolution of pain and repeat PoCUS showed resolution of intussusception. After surgical consultation, serial PoCUS, and observation, the patient was discharged. The second and third patients underwent partial bowel resection and had an uneventful postoperative course. Conclusion: Adult bowel intussusception is likely more common than previously thought when considering transient and non-obstructive cases now diagnosed on MDCT. A structured approach with POCUS and an understanding of the sonographic findings can support the use EP PoCUS for the sonographic bedside diagnosis of intussusception and monitoring of improving patients.

Keywords
ultrasound, intussusception, bowel

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
Background Effective and engaging public speaking is a skill that facilitates academic advancement in healthcare by increasing name recognition as a source expert and creating networking and collaborating opportunities. Studies suggest that female speakers are under-represented in academic settings and face unique challenges in developing speaking skills. To address this problem, our institution's resource group "Women Advancing and Achieving in Medicine" piloted a women's speaker training program. This study aims to assess feasibility, value to participants, and effectiveness in encouraging public speaking.

Methods Participants were nominated by department chairs to attend a 6-month program created in collaboration with Speaker Sisterhood, a network of speaking clubs for women. Sessions included didactics, speaking exercises and immediate group feedback, culminating in a final videotaped speech by each participant. Participants completed a before and after validated survey "Personal Report of Communication Apprehension" (PRCA_24). Qualitative reported value to participants was documented in their final videotaped session. Non-parametric Wilcoxon Ranks Signed tests were run in conjunction with descriptive statistics using SPSS software.

Results 28 participants registered for the program, 57.7% being attending physicians and the remainder trainees or advanced practitioners. Over 70% of participants reported professional advancement as motivation to attend. 16 completed the pre and post-survey PRCA-24. Post-program scores (55.5, IQR 53.75-63.25) were statistically significantly lower than pre-program scores (65, IQR 58.75-66.5, p<0.036) indicating decreased apprehension with communication. Subjective quotes following the program described an increased comfort with teaching, "speaking up" and "finding our voice". 100% of the participants reported that the program met expectations and would be recommended to peers.

Conclusion This pilot women's speaker training program resulted in decreased apprehension around public speaking among our participants. Participants reported the program gave them in increased comfort in teaching that may lead to career advancement. As this was a pilot, further work is needed to expand the program and assess additional factors that will foster academic achievement for women.

Keywords speaking professional women career advancement
Background
Emergency Department (ED) boarding of patients awaiting inpatient psychiatric placement has increased. It is well established that transition of care is a time when errors can be made resulting in poor patient care. Recently, our ED implemented a standardized sign-out form to be completed by the initial treating physician that is given to subsequent physicians during transition of care aimed at reducing errors and better caring for patients while awaiting psychiatric placement. This study aims to evaluate whether ED physicians felt these forms had a positive impact on care of boarding psychiatric patients.

Methods
A cross sectional survey was created to evaluate ED physicians’ perceptions of the impact of the sign out initiative on clinical management of boarding psychiatric patients. All full time ED attending physicians at Baystate Medical Center were invited to complete the survey. Respondents were asked if they felt the following aspects of care were changed since implementation: patients getting home medications ordered, addressing abnormal lab values, HCG testing on appropriate patients, glycemic control in diabetic patients, and overall care of patients awaiting inpatient psychiatric placement. Survey responses were anonymous and included open text for physicians to provide suggestions for improvement. Simple descriptive statistics were used for analysis.

Results
22 of 28 eligible ED physicians responded to the survey (78.6% response). Overall, 91% or respondents felt that implementation of the sign-out initiative led to improvements in the care of patients awaiting psychiatric placement. Specifically, 86% of respondents identified higher frequency of home medication ordering, and 70% identified that abnormal labs were being addressed more frequently. Additionally 64% stated that HCG testing was completed more often and 86% of respondents felt diabetic patients had improved glycemic control during their ED boarding.

Conclusion
ED physicians felt that implementation of a standardized sign-out initiative for patients awaiting inpatient psychiatric placement improved overall care in the areas of home medication ordering, glycemic control, and appropriate follow up of important laboratory values. Results suggest an opportunity for institutions caring for psychiatric boarding patients to improve transitions of care.

Keywords
psychiatric transition of caresign out medical error boarding
Systematic Capture of Patient Triage Phenotypes From Emergency Department Electronic Health Records

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Background: Clinical phenotyping of patients at ED triage may improve resource assignment and risk assessment. We hypothesized that computational summarization of electronic health record data would reveal patient phenotype clusters that stratify by visit disposition. Methods: This retrospective study included ED visits between March 2014 and July 2017 from three EDs resulting in either admission or discharge. A total of 972 variables were extracted per patient visit, including demographics, chief complaint, historical vitals, labs, and medications. We used principal component analysis (PCA) and uniform manifold approximation and projection (UMAP) to summarize 100,000 patient visits bootstrapped from a total of 560,000 visits while withholding disposition decision and triage score. We then assigned phenotype clusters with Gaussian Mixture Models and calculated cluster agreement with Adjusted Rand Index (ARI). Results: Sampled patient visits had an admission rate of 29.72 ± 0.03% (95% CI). Visualization of data available at triage summarized with PCA revealed three phenotypes stratified by admission risk (54.42 ± 0.08%, 17.74 ± 0.10%, 17.31 ± 0.05%), while UMAP revealed four phenotypes (max: 49.75 ± 1.85%, min: 19.75 ± 0.14%). For both methods, phenotypes differed primarily by demographic and socioeconomic factors. We then algorithmically selected the optimum number of clusters for PCA finding 24.7 ± 2.7 phenotypes with a range of admission risks 8.15 ± 0.06% to 75.36 ± 0.24%. The ARIs for PCA and UMAP with 25 clusters were 0.55 ± 0.02 and 0.41 ± 0.01, suggesting that consistent group assignments were found with each method. Conclusion: Computational patient phenotyping with PCA and UMAP reveals a finite, reproducible number of clinical clusters that risk stratify patients by disposition at the time of triage. Further research is needed to extract patient characteristics defining each phenotype.

Keywords
electronic health records, machine learning, phenotype discovery, risk stratification, triage
Background: Recently, much attention has been drawn to the adverse effects of implicit bias. Implicit Association Tests (IATs) have been developed and validated as a means of evaluating unconscious preferences, e.g. with regard to race or gender. Leadership in the Department of Emergency Medicine (EM) at our institution has identified increasing diversity and inclusion as a key departmental priority. To better understand our faculty group’s unconscious biases, prior to the annual EM faculty retreat all faculty were asked to complete a survey including self-reported results from two IATs. Methods: Surveys were sent via email prior to the retreat. Faculty were asked to report their results from IATs designed to reveal 1) unconscious racial preferences for black vs white people (“race IAT”) and 2) association between male/female gender and the sciences vs liberal arts (“gender IAT”). Responses were submitted anonymously. Results: Forty faculty members responded to the survey (response rate 66%), 70% of whom were male and 80% of whom self-reported as white. Nearly half (45%) reported a race IAT result indicating a preference for white people, while 20% reported an automatic preference for black people. On the gender IAT, the majority of respondents (59%) demonstrated an automatic association between males and sciences, and females with liberal arts. More male than female respondents reported this association (66.7 vs 41.7%). One third of female respondents reported the opposite association, i.e. females with sciences, males with liberal arts. Only 40% of respondents indicated they felt the results of their race IAT were accurate, while most (57.5%) agreed with their gender IAT. The distribution of reported IAT results among EM faculty mirrors that of the general population for the gender IAT, but differs for the race IAT, with fewer faculty reporting an automatic preference for white people than the general population. Conclusion: Although unconscious biases related to race and gender are not unique to EM, a purposeful attempt to increase self-awareness of implicit associations may help to mitigate unconscious biases. The present departmental effort demonstrates the utility and acceptability of IATs as a tool for stimulating potentially sensitive discussions related to a diverse workforce and equitable patient care.

Keywords
Diversity and inclusion, implicit bias, equity, race, gender
Background: Single payer health care is supported by a majority of Americans, yet its effect on ED reimbursement and consumer costs is understudied. Objective: To determine the effect of two single payer system variants on reimbursement and out of pocket (OOP) spending for emergency care. Methods: We used the 2013-2016 Medical Expenditure Panel Survey (MEPS) to determine average reimbursements and OOP expenditures for the primary payer for each visit. We excluded ED visits resulting in admission, as ED expenditures are not available. We used the 2015 National Hospital Ambulatory Medical Care Survey (NHAMCS) to determine the distribution of ED visits by primary payer. We modeled two reform scenarios: “Medicare-for-All” and an alternate scenario where Medicaid remained intact for those meeting current eligibility. We applied an empiric range of consumer price elasticities of demand to adjust for utilization changes within a range of cost-sharing requirements. After predicting the expected changes in visits and reimbursement for each payer, we determined the expected change in total ED reimbursement and OOP costs under both reform scenarios. Results: A total of 18,840 ED visits representing 107,924,881 weighted visits were included. The weighted total visits (in millions) included Medicare (14.1), Medicaid (39.5), dual enrolled (3.5), commercial (34.5), other (3.6), and uninsured (12.6). Assuming no changes in reimbursement, a Medicare-for-All scenario would increase total annual reimbursement (in billions) from $101.3 to $114.8 (range $107.1 to $122.5). This is primarily from higher mean payments for visits among those currently with Medicaid or no insurance, which offsets the lower mean payments for the commercially insured. In the combined Medicare/Medicaid scenario, annual reimbursement (in billions) would decline to $96.0 (range $87.1 to $104.8). Average OOP costs were predicted to decrease from $102 per visit to $46 with Medicare only and to $32 with Medicare/Medicaid. Conclusion: Medicare-for-All may increase ED reimbursement and reduce OOP costs, while preserving Medicaid in a single payer system may reduce ED reimbursement.

Keywords
Medicare, Emergency Care, Single Payer Plan
**The Practitioner’s Guide to Global Health: an online curriculum preparing medical learners for field experiences**

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**Background:** Short-term experiences in global health (STEGH) are increasingly common in medical education, as they can provide learners with opportunities for service, learning, and sharing perspectives. Academic institutions need high-quality preparatory curricula and mentorship to prepare learners for potential challenges in ethics, cultural sensitivity, and personal safety; however, availability and quality of these are variable. The objective of this study is to create and evaluate an open-access, interactive massive open online course (MOOC) that prepares learners to safely and effectively participate in STEGH, permits flexible and asynchronous learning, is free of charge, and provides a certificate upon successful completion.  

**Methods:** Global health experts from 8 countries, 42 institutions, and 7 specialties collaborated to create The Practitioner’s Guide to Global Health (PGGH): the first course of this kind on the edX platform. Demographic data, pre- and posttests, and course evaluations were collected and analyzed.  

**Results:** Within its first year, PGGH enrolled 5935 learners from 163 countries. In a limited sample of 109 learners, mean posttest scores were significantly improved (p < 0.01). In the course’s second year, 213 sampled learners had significant improvement (p < 0.001).  

**Conclusion:** We created and evaluated the first interactive, asynchronous, free-of-charge global health preparation MOOC. The course has had significant interest from US-based and international learners, and posttest scores have shown significant improvement.

**Keywords**  
global emergency medicine international emergency medicinencurriculum education preparation
The Red Book: The Hartford Hospital Guide to Critical Care in the Emergency Department

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Keywords
Critical Care, Educational Guide, Emergency Medicine, Resident Education

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
The Relationship Between Magnitude of International Normalized Ratio and Outcome After Traumatic Brain Injury

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Background: International Normalized Ratio (INR) is a measure of the extrinsic coagulation cascade. Elevated INR is associated with increased risk of bleeding and mortality after Traumatic Brain Injury (TBI). This study examines the relationship between magnitude of INR abnormality and outcomes in the ProTECTIII multi-center clinical trial.

Methods: Subjects with moderate-severe traumatic brain injury (TBI) were enrolled in ProTECTIII across 42 sites (n=882) between 2010 and 2013. Elevated INR (value >1.4) was documented per patient on electronic case report forms. Maximal value of INR (INRmax) during the first two weeks after enrollment was identified for each subject and grouped into quartiles (1.41-1.5, 1.51-1.6, 1.61-1.8, >1.8). Three outcome measures were examined: death, craniotomy (within 2 weeks of injury), and 6 month functional outcome. Functional outcome was measured by Glasgow Outcome Scale Extended (GOS-E, stratified dichotomy). The relationship between INRmax and outcome was assessed using the Wilcoxon Rank-Sum Test and logistic regression of the INRmax quartiles.

Results: INRmax was identified in 191 patients, from 491 instances of INR>1.4 in the two weeks after injury. Median INRmax=1.60 [95% CI:1.55,1.60]. INRmax was significantly related to both poor functional outcome (median 1.60 [95% CI:1.60,1.70] vs 1.50 [95% CI:1.50,1.55], p=0.0002) and mortality (median 1.70 [95% CI:1.60,1.90] vs 1.54 [95% CI:1.50,1.60], p<0.0001). The odds of poor outcome with INRmax>1.8 was 3.8 times greater than for INRmax 1.41-1.5 (OR: 4.8, 95% CI:2.08, 11.30). The odds of death for INRmax>1.8 was 8.3 times greater than that for INRmax 1.41-1.5 (OR:9.3, 95% CI:3.31, 25.96). Craniotomy was not associated with INRmax (p=0.81).

Conclusion: Maximum INR value is associated with six-month functional outcome and death within two weeks after traumatic brain injury. Future analyses will explore the area under the curve between INR value and outcome after traumatic brain injury.

Keywords
International Normalized Ratio, INR, Coagulopathy, Traumatic Brain Injury, TBI
Background
Studies have shown conflicting evidence in the relationship between time to target temperature and outcomes following cardiac arrest treated with targeted temperature management (TTM). One possible explanation for this discrepancy is differences in patient thermoregulatory ability as a result of ischemia-reperfusion injury. This study examined the relationship between amount of energy to rewarm a patient to normothermia and outcomes. We hypothesized that patients with favorable outcomes would require less energy to return to normothermia after active cooling.

Methods
This was a prospective observational single-center study of adult post-cardiac arrest patients who received TTM to 32C–36°C by a surface cooling device between 5/18-11/18. Time to rewarming was defined as time from initiation of rewarming to first time the patient temperature reached 37°C. Patient heat generation was calculated as the inverse of the average water temperature from the cooling device x time to rewarming x 100 and standardized in two ways to account for variation in target temperature: (1) divided by number of degrees the patient was rewarmed and (2) calculated only as the amount of energy required to increase patient temperature from 36°C to 37°C. Our primary outcome was favorable neurologic status at hospital discharge, defined as a Cerebral Performance Category (CPC) score of 1 or 2; secondary outcome was survival to hospital discharge. Univariate analyses were performed using Wilcoxon rank-sum tests and multivariable analyses using logistic regression. Results Of 43 patients meeting inclusion criteria, 13 were excluded (12 never rewarmed, 1 did not reach target temperature, 1 traumatic arrest). Of 30 patients remaining, survival to hospital discharge was 37%, of which 91% of survivors had CPC 1-2. In univariate analysis and when controlling for initial rhythm, there was no difference (p > 0.05) between energy required to increase a patient’s temperature 1°C and outcomes or between energy required to bring a patient from 36°C to 37°C and outcomes. This is a pilot study; to be adequately powered (80%) to detect a difference in outcomes, 65 patients are needed.

Conclusion
In this pilot study, we found no statistically significant association between amount of energy required to rewarm a post-arrest patient after TTM and outcomes.

Keywords
Cardiac Arrest, Targeted Temperature Management, outcomes
Time on shift and decision to prescribe opioid medications

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Background Opioid prescription drug abuse is an epidemic. Emergency physicians often face the difficult decision of whether to prescribe opioids and risk addiction and abuse, or withhold them and risk inadequate pain control. Previous research of suggests that physicians' prescribing practices for potentially unnecessary medications may become more permissive over the course of a shift due to factors such as fatigue, limited time, competing demands, and distractions. However, hospital policies requiring consultation of prescription drug monitoring program (PDMP) databases require significant effort and time, and may limit opioid prescriptions during a busy shift. The objective of this study is to assess whether individual prescribing practices of opioid drugs change over the course of a shift.

Methods This was a single center observational study at a Level 1 academic Emergency Department with over 57,000 annual visits. We analyzed consecutive pain-related visits that occurred between 2010 – 2017, and classified them according to national guidelines as opioids sometimes indicated (fracture, renal colic, cancer) and opioids less often indicated (low back pain, headache, fibromyalgia). Using conditional logistic regression, we estimated the probability of opioid prescribing for pain-related visits as a function of shift hour, calendar month, time of day, patient level confounders (age, sex, pain score), and fixed effects for clinicians. Results Out of 8,613 visits, 37% resulted in an opioid prescription. For visits for which opioids are sometimes indicated, prescribing did not significantly vary over the course of a shift (p > 0.05). For visits for which opioids are less often indicated, relative to the first third of the shift, opioid prescriptions progressively fell in the middle (OR 0.75, 95%CI 0.59-0.90) and last third of the shift (OR 0.66, 95%CI 0.53-0.81). Conclusion Emergency physicians’ likelihood of prescribing opioids decreased over the course of a shift. This supports the hypothesis that as physicians become increasingly busy over the course of a shift, they may find patient lookup in prescription databases increasingly onerous and time-consuming to merit an opioid prescription. To this extent, PDMPs may have an unintended “chilling effect” on opioid prescriptions, beyond the population with documented opioid abuse.

Keywords  
Opioid, narcotics
Background
Early STEMI identification using electrocardiogram (ECG) in Emergency Department (ED) patients is critical to timely intervention. The AHA recommends all ED chest pain ECGs be obtained within 10 minutes of arrival and immediately screened for STEMI. Approximately 40% of ECGs done in triage are interpreted as “Normal ECG” (NECG) or “Otherwise Normal ECG” (ONECG) by internal computer software and may not need immediate screening, however the reliability of these readings is uncertain and no studies have investigated the time spent obtaining a confirmatory read. This study aims to determine the time it takes for Patient Care Technicians (PCTs) to have ED attendings screen ECGs for adult triage patients.

Methods
This prospective cohort study was performed at a single academic ED with a volume of 122,000 visits/year. All adult ED patients who had a triage ECG performed according to standard protocol were included. ECGs were obtained within 10 minutes of arrival and immediately taken to an ED attending for review. All ECGs were time-stamped when the PCT departed triage and again upon PCT return. The data were entered into RedCap and descriptively analyzed.

Results
We collected 1,768 ECGs during the 4-month study. Patient gender for all ECGs collected was M: 44% and F: 56%. The mean subjects’ age was 53.6 years. Distribution of automated readings was: “NECG” 33.7%, “ONECG” 11.2%, with borderline and abnormal making up the remaining 55.1%. Seven percent of the ECGs were missing or had an unreadable departure or return timestamp. The median time PCTs spent getting an ECG screened was 2.8 minutes (IQR 2.4). Total time spent getting an ECG read by a physician during the study period was 76.7 hours. Attending physicians were interrupted on average 14.6 times per day to screen these ECGs.

Conclusion
This study demonstrates that screening ECGs from triage is a time-consuming process that, perhaps unnecessarily, increases the number of physician interruptions. Although our findings are not generalizable, issues pertaining to workflow, interruptions of providers, patient care, and patient safety are universal. Next steps include comparing the “NECG” and “ONECG” readings with a cardiologist’s impressions to determine if physician screening can be deferred until the clinical encounter.

Keywords
ECG screening triage interruptions
Ultrasound of Carotid Blood Flow and Flow Time after Passive Leg Raise in Euvolemic Patients

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Background: Noninvasive measurement of volume responsiveness may improve care of critically ill ED patients. Ultrasound (US) measurement of cardiac output by left ventricular outflow tract velocity time integral (LVOT VTI) before and after preload augmentation with passive leg raise (PLR) shows promise as a predictor of volume responsiveness but is limited by a need for echocardiography skill and variable sonographic windows. Changes in carotid blood flow (CBF) and corrected carotid flow time (FTc) with PLR may be more reliably measured and have been studied as a predictors of volume responsiveness. Data from euvolemic patients is limited. We sought to determine how carotid flow parameters change with PLR in euvolemic ED patients and if these changes predict volume responsiveness.Methods: We prospectively enrolled a convenience sample of non-pregnant adult patients in sinus rhythm with complaints unrelated to volume status at a tertiary care academic ED. Patients with known carotid atherosclerotic disease or prior carotid surgery were excluded. Emergency physicians used point-of-care US to measure carotid FTc, CBF, and cardiac output by LVOT VTI before and after 60 seconds of PLR. Patients with increase in cardiac output of 10% after PLR were considered volume responsive. Descriptive statistics were used to analyze data.Results: 43 patients were enrolled; 2 refused participation and 1 was excluded due to history of carotid atherosclerosis leaving 40 for analysis. Cardiac output, FTc, and CBF increased by a mean of 5.8% (95% CI 0.2% to 11.4%), 6.9% (95% CI -0.2% to 14.0%), and 5.8% (95% CI -2.2% to 15.2%), respectively. 15 (37.5%) were volume responsive. Carotid FTc increase of 10% had sensitivity of 26.7% and specificity of 84% to predict volume responsiveness, with positive predictive value (PPV) of 50% and negative predictive value (NPV) of 65.6%. CBF increase of 10% had sensitivity of 46.7% and specificity of 68% to predict volume responsiveness with PPV of 46.7% and NPV of 68%.Conclusion: In euvolemic, ED patients there was a mean increase of 6-7% in carotid FTc, CBF, and cardiac output after PLR. In this setting, carotid FTc and CBF did not accurately predict significant increases in cardiac output after PLR.

**Keywords**  
ultrasound, volume-responsiveness, resuscitation, VTI, carotid, passive-leg-raise
Background: Emergency departments (EDs) are inherently prone to being busy as patient volume is uncontrollable and variable. We propose that smaller EDs are more susceptible to having “busy” days than larger EDs. Different measures have been used to qualify a busy day, however, a definitive cutoff has not been yet established and embraced. This study defines a busy day using the daily volume relative to the median volume and evaluated multiple EDs to investigate if the frequency of busy days was greater at smaller EDs.

Methods: Retrospective patient arrival data was queried from a database that included patient visits from 38 EDs over 33 months. Linear regression models were developed on the data to determine the significance of mean daily volume for modeling the percent of days that crossed three volume change thresholds. These thresholds were set at daily volumes of at least 5%, 10%, and 15% greater than the site’s median daily volume. The frequencies of days exceeding the thresholds were the outcome variables in the models while the mean daily volume was considered the independent variable.

Results: A total of 5,721,736 visits from 38 EDs were analyzed. For each of the three different thresholds for increased volume, more than half of the variability in the percent of days that exceeded the threshold was explained by variability in the mean daily volume. In the developed linear regression models, the slopes of all three lines representing the three thresholds were -0.0004, and statistically significant at p=.0001. This means that for each increase of 25 patients per day on average, the ED can expect a 1% decrease in the frequency of days that cross a given volume threshold. An ED with a mean daily volume of 100 will have a +10% day about 19% of the time, whereas an ED with a mean daily volume of 200 will have a +10% day only 15% of the time.

Conclusion: Lower volume EDs tend to have more days that exceed their median daily volume than EDs with higher volume, and thus endure “busy” days more frequently. Given the lack of a standard measure to define a “busy” day, 10% above the daily median volume is proposed.

Keywords
surgepatient volume
Year-to-Year Trends in Emergency Medicine Morbidity and Mortality Rounds

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Background Morbidity and Mortality (M&M) rounds are peer review conferences during which cases with adverse outcomes and difficult management decisions are presented. Their primary objective is to learn from complications and errors, modify behavior and judgment based on previous experiences, and prevent repetition of errors leading to complications. It is unclear if there is a difference year-to-year in the chief complaints (CC) of M&M cases or if cases vary by attending experience. The objective of this study was to determine whether EM M&M cases vary by CC or attending level of experience on a year-to-year basis. Given one of the primary M&M goals of preventing repetition of errors, we hypothesized that there would be a difference amongst CC from year-to-year and a difference based on attending experience.

Methods All M&M cases from 1/2014-12/2017 derived from an urban, tertiary referral ED with >55,000 annual visits were reviewed and grouped into 12 different CC categories and by attending years of experience (1-4, 5-9 and 10+). Number and percent of M&M cases by CC and years of attending experience were calculated by year and a chi-squared analysis was performed.

Results There were 350 M&M cases presented over the study period. There was a significant difference between CC categories from year-to-year (p<0.001), with cardiac (15.4%), neurologic (15.4%), respiratory (12.3%) and blunt trauma (13.7%) the overall majority of cases. There was a downtrend in neurologic (18.2% to 12.4%) and toxicology cases (12.3 to 2.0%) and an uptrend in cardiac (6.9% to 24.5%) and hematologic cases (13.9% to 21.4%) over the study period. Attendings with 1-4 years of experience had the majority of cases (46.3%), while those with 5-9 years had the fewest total cases (15.1%, p<0.001). There was an increase in proportion of cases by attendings with 1-4 years of experience from 31.9% to 46.9%, while those with 5-9 years decreased from 20.8% to 12.2% (p<0.001).

Conclusion There was a persistent significant difference across CC categories of M&M cases from year-to-year. Newer attendings show increased rates of M&M cases relative to more experienced attendings with a downtrend in cases after five years of experience. There may be a distinctive educational benefit of participation at M&M for newer attendings with fewer than five years of clinical experience.

Keywords
Morbidity and mortality; education; quality assurance

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
Medical Home Intervention and ED Utilization in Unstably Housed People Living With Human Immunodeficiency Virus

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Innovation
Unstably housed people living with human Immunodeficiency virus (PLWH), particularly those with concurrent substance use disorders and psychiatric conditions, may have complicated healthcare needs and use the Emergency Department (ED) instead of, or in addition to primary care providers. Some research has found that finding medical homes and addressing homelessness may be associated with decreased ED utilization. This study investigates the impact of a medical home intervention on ED utilization. An innovative program of patient navigation at nine sites had a positive effect on the primary outcomes of improving housing stability and retention in HIV primary care in people living with HIV (PLWH) and co-occurring substance use and psychiatric disorders. Secondary outcomes included an evaluation of this novel program on ED visits. This study evaluated ED data from patients in the 4 sites for which ED data was available. Unstably housed PLWHA who had substance use or mental health disorders were enrolled in a medical home intervention at one of 4 sites. The intervention consisted of intensive care coordination via patient navigators in the clinic and in the field. Data were obtained from participant interviews and electronic health records. ED visit frequency, diagnoses, ICD-10 codes, and impact of social determinates of health were evaluated. Outcomes from 12 months pre- and post-enrollment were compared. Most enrollees were male, mean age of 44.6 years. There was a trend in increased ED visits/person across all sites (2.7 vs 3.1). Total ED visits increased at three sites after the intervention, and decreased at one site. One site showed a statistically significant difference in mean ED visits/person in the year after enrollment (3.8) compared to the year prior to enrollment (2.1). The most common ED diagnosis was “febrile syndromes”.

As part of the medical home, HIV care teams comprised of professional and peer patient navigators sought to link PLWH to housing and health care services. Navigators provided practical services, such as facilitating procurement of IDs and mobile phones, transportation, and coordination with landlords and social service providers to obtain housing and housing assistance. The intervention had mixed effects on ED use across sites; there was a trend towards increased ED usage, and one site had significantly more ED visits after receiving the intervention. Participant demographics and characteristics varied significantly among sites at baseline, likely contributing to the differential effect of the intervention on ED use. The site with significantly increased ED use had a higher proportion of enrollees with reported opioid use, recent incarceration and viral suppression, greater mean years experiencing homelessness and HIV/AIDS, and less educational attainment. There was no significant difference in viral suppression rates at 12 months when comparing individuals with increased, decreased, or no change in ED use. Further studies should explore factors related to ED use in the context of housing/health care interventions for PLWH and to assess whether ED use may be a marker of positive healthcare engagement. Reduction in ED utilization is not necessarily a desirable goal when working with patients with high unmet needs. Another consideration is that the site with the fewest ED visits after the intervention was notable for its enhanced communication between ED providers and other health care providers working with the unstably housed in an outpatient setting. At this site, participants who were seen in the ED were immediately connected to their medical home team for intense follow-up post release. Strategies to build communication between ED care teams and mobile medical teams in the field are important in any effort to safely reduce ED utilization rates.

Keywords
Social Emergency Medicine, Prevention/Public Health, Infectious Diseases, Operations/Quality Improvement

23rd Annual New England Regional Meeting, March 27, 2019, Worcester, MA
A Multimodal Curriculum on Intimate Partner Violence for Medical Students in an Emergency Medicine Clerkship

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Innovation
Intimate partner violence (IPV) is prevalent in the US. Frequently victims of IPV have contact with the ED, providing opportunity for intervention. Prior studies show physicians are more likely to screen for IPV if they received specific training. Currently, such training varies widely across medical schools and is not universal. A dedicated curriculum on IPV during an EM clerkship may be an effective means to increase student comfort level and knowledge.

We aimed to create a multi-modal curriculum on IPV for medical students in an EM clerkship, implement the curriculum, and assess learners’ perceived knowledge and comfort level in recognizing, discussing, and responding to victims of IPV. After participating in the curriculum, learners will understand the health implications of IPV and increase their comfort level in recognizing, discussing, and responding to victims of IPV.

An interdisciplinary team of social work and medical education faculty designed a multimodal curriculum on IPV. The curriculum consists of two parts: a 20-minute instructional video and a case-based didactic session. Second-year medical students in a required EM clerkship were enrolled in the curriculum. Students watched the video and then participated in a 1-hour discussion session using patient vignettes. Students completed pre- and post-curriculum self-assessment surveys.

Survey results were analyzed to identify change in self-assessed comfort level and knowledge in 13 domains using a 1-5 visual analog scale (1 being strongly disagree, 5 being strongly agree). To date, 10 students have completed the curriculum. The mean response was 3.21 (95%CI 2.71-3.71) on the pre survey and 4.29 (95%CI 3.84-4.74) on the post survey, p<0.001.

Contact with the ED is common amongst patients suffering from IPV. There is evidence that asking patients about IPV increases the chances they will disclose and therefore be referred to appropriate resources. Studies suggest that lack of training is an obstacle to evaluating for IPV for clinicians. Given the relevance of IPV to EM, we sought to determine if an EM clerkship could be an effective setting in which to provide education and training to medical students regarding IPV. We sought input from our social work team who have extensive training and education on the topic. We created a 20-minute video discussing the definitions and prevalence of IPV, its relevance to EM, health consequences of IPV, tools and tips for discussing IPV with patients, available resources for patients, mandatory reporting laws, and documentation. We then explored all of these topics and practiced student’s skills using specific case-vignettes in a discussion-based didactic session. To date, ten students have completed the curriculum as well as pre- and post-curriculum self-assessment surveys. Our preliminary data suggest that the curriculum increases learner self-assessed comfort, knowledge and skill level in assessing and responding to IPV. Furthermore, an EM clerkship may be an effective setting in which to implement this type of training. Implementation of the curriculum with additional data-gathering and analysis is ongoing. We plan to implement the curriculum with a total of approximately 60 students in the academic year, and perform matched analyses to evaluate for change in self-perceived comfort and skill level. We also plan to perform follow-up surveys after 6 months to analyze for wash-out.

Keywords
Education, Sex & Gender, Social Emergency Medicine,
A Simulation-Based Curriculum on Best Practices for Firearms Safety

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Innovation
Gun violence in the United States is a significant public health concern, and EDs have been found to be at risk for the entry of firearms. Emergency providers (EPs) have been shown to have low levels of familiarity with firearms. Given the risks for encountering firearms while at work in the ED, EPs may benefit from dedicated training on safely handling firearms. After participation in this curriculum learners will be able to: (1) describe safety measures if a firearm is found on a patient in the ED, and (2) demonstrate the ability to safely remove a firearm from the clinical work space until it can be managed by security personnel.

An 8-item competency checklist was created using a modified Delphi approach. In the course of a regular simulation session the students discovered a model firearm in the patient’s belongings and were asked to remove it. Their baseline performance was evaluated using the checklist. Students were taught to safely handle firearms. Two weeks later, the students were presented with a model firearm in a different simulation case and evaluated on their ability to safely remove it. Fourteen students completed the curriculum. The median number of correctly performed steps pre-intervention was 5 (IQR 4-6), and post-intervention was 7 (IQR 7-8, p=0.002). Learners showed statistically significant improvement in 2 steps: pointing the firearm in a safe direction at all times (3/14 to 14/14, p=0.001) and holding the firearm by the grip only (6/14 to 14/14, p=0.008).

This pilot study investigated the effectiveness of a novel curriculum on best practices in firearms handling. Participants included medical students rotating on their EM sub-internship and EM bootcamp elective. An 8-item competency checklist was created by a group of attending EPs and hospital security personnel in accordance with gun safety standards, using a modified Delphi approach. Each student was asked to evaluate a patient with dyspnea during a regular simulation session. A model handgun was placed in the patient’s belongings, and upon discovering it the students were asked by the nurse to remove the firearm. The students’ baseline performance was evaluated using the checklist. Students then participated in a small group hands-on didactic on how to safely handle firearms found in patients’ belongings. Students completed surveys regarding their baseline knowledge of, exposure to, and comfort with handling firearms. Two weeks later, the students were again presented with a model firearm in a different high-fidelity simulation case and asked by the nurse to remove the firearm. Students were evaluated using the checklist and directed individual feedback was given.

Fourteen students completed the curriculum. The median number of correctly performed steps pre-intervention was 5 (IQR 4-6), and post-intervention was 7 (IQR 7-8, p=0.002). Learners showed statistically significant improvement in 2 steps: pointing the firearm in a safe direction at all times (3/14 to 14/14, p=0.001) and holding the firearm by the grip only (6/14 to 14/14, p=0.008).

This innovation is the first to formally teach learners on the safe handling of firearms found in the ED. This low-cost pilot project is easily transferrable to other training centers for teaching principles of safe firearms handling.

Keywords
Education, Operations/Quality Improvement, Simulation,
Innovation

Patient monitoring systems are overly sensitive, frequently confused, and easily deceived in live patient care settings, while also failing on occasion to effectively advise care providers of true life-threatening events. Investigators initiated a collaborative biomedical, human factors, and information engineering program to study and mitigate alarm fatigue by developing and implementing non-proprietary monitor interfaces and a bedside experimental research pipeline infrastructure. Research datasets acquired in live ED settings are being openly disseminated for collaborative initiatives. The AHRQ-funded (R18 HS022860) Push Electronic Relay for Smart Alerts for End User Situational Awareness [PERSEUS] research program sought to develop, implement, and share open innovations to enable the constructive study of alarm fatigue and the scientific advancement of bedside clinical informatics (BCI). One of the program's primary aims was to disseminate a non-proprietary medical technology interface toolbox and study-acquired datasets for continued medical device and informatics research at the study institution and beyond.

The primary study site was a 719-bed non-profit tertiary care referral facility and Level I trauma center. Investigators used the BCI research pipeline infrastructure to access ED patient bedside monitor datastreams with 24/7/365 continuous recording. Modular code was added on to enable experimental data processing and patient monitoring approaches at the clinical bedside in a safe, controlled, and institutionally-approved manner. Acquired data were de-identified, adjudicated/annotated, and packaged for open dissemination through established Web portals.

The program's research pipeline infrastructure was successfully activated, configured, applied, and use-tested to conduct online (bedside) and offline patient monitor datastream analytics. A safe, on-site research, development, and test environment for patient monitor signals analysis and experimentation was established in a 15-bed ED clinical care space and enabled successful acquisition, processing, and analysis of large datasets (available online): 5,337 source .json files (1.7Tb); 2,462 adjudicated/annotated datastream [ATOMICS-0/-1/-2/-3] files (133Gb); clinical correlate [ATOMICS-CC] dataset (in preparation). A non-proprietary bedside patient monitor interface system was applied with off-the-shelf software to acquire large datasets of live ED patient physiologic datastreams over 12 months. The processed, adjudicated / annotated, de-identified, packaged, and openly disseminated datasets will enable collaborative research of experimental patient monitoring and data analytic approaches. The bedside clinical informatics approach developed by the research team enables access to a significant proportion of patient monitors (Philips Intellivue, estimated at 30% market share globally) in current use—applying the toolkit and techniques described will liberate datastreams from closed, blackboxed architectures that have presented significant challenges to open research initiatives. The large datasets acquired by the research team represent a voluminous collection of (de-identified) physiologic datastreams from thousands of live patients with varying illnesses, injuries, comorbidities, and outcomes—these data are hoped to serve as a primer and testbed for next-generation patient monitoring research.

Keywords
Research Methods, Informatics/Social Media, Operations/Quality Improvement, Critical Care/Resuscitation
Teaching High Value Care in the Face of Medical Uncertainty: A Novel, Interdisciplinary Curriculum

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Innovation
Over $700 billion healthcare dollars are wasted annually with up to 40% due to unwarranted use. Diagnostic uncertainty often drives these increases specifically in laboratory testing and radiologic imaging. Cost effective and patient-centered care is an essential part of modern clinical practice. Discussing diagnostic uncertainty with patients is integral to shared decision making and fundamental to providing high value care (HVC). These concepts are not often formally taught to residents and faculty, but are essential.

Review the principles of HVC. Describe how value incorporates safety, affordability and patient experience. Share strategies for teaching learners the principles and practice of HVC. Discuss ways to improve the tolerance of uncertainty in our learners as a way to improve the provision of HVC to our patients.

This is a multi-departmental physician development session using case-based examples, videos and breakout sessions to highlight opportunities for HVC in clinical practice and promote strategies to incorporate these concepts into shared decision making. Anchored on the 5 micro-skills of teaching value framework (an adaptation of the 1-minute preceptor): 1.) Get a commitment to discuss value. 2.) Probe for supporting evidence. 3.) Teaching rules of value. 4.) Reinforce cost principles. 5.) Reflect on unnecessary care.

Over 30 faculty members have participated in the workshop. In follow-up, 23 faculty participants were observed to have a higher frequency of teaching HVC in the clinical setting compared to 28 non-participant controls (0.9 vs 0.6 times/hour of instruction, p<0.003).

Understanding HVC in the setting of medical uncertainty is crucial to shared decision making in clinical practice. This multi-departmental workshop allowed participants to understand and practice these principles. It can be easily adapted to any department or institution's educational needs. The ultimate goal is for participants to promote faculty development sessions within their own departments and institutions.

Keywords
Education, , ,

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ED-Initiated MAT: Lessons Learned One Year After Launch

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Innovation
EDs nationwide are expanding their roles in the care of patients with opioid use disorder (OUD), and many have begun ED-MAT programs. In May of 2018, our ED instituted an ED-MAT protocol. Since then, we have identified multiple behavioral barriers, affecting both providers and patients, that have limited wide-scale early adoption of our protocol. The lessons learned from our innovative program may be useful as other hospitals plan their own MAT programs.

While greater than 90% of our attending physicians now have DEA-X waivers and are able to prescribe buprenorphine, there remains opportunity to increase the rate of MAT initiation in our ED. This is consistent with previous findings that many providers who obtain their waivers underutilize them. We set out to examine the behavioral barriers to providers’ use of our MAT initiation protocol and patients’ willingness to seek help in obtaining OUD treatment in our ED.

A behavioral map was created to outline the decisions and actions required for ED providers to follow the MAT initiation protocol. Semi-structured interviews were conducted with 21 medical providers from our ED: 7 attending physicians, 5 residents, 4 physician assistants, 4 nurse practitioners, and 1 registered nurse. Along with the provider interviews, we also conducted interviews with 10 patients with OUD to better understand their barriers to treatment in our ED.

Four behavioral barriers impacting adherence to the MAT initiation protocol by providers were identified, specifically: time pressure, a lack of cues to ask about opioid misuse, uncertainty with treatment protocols, and a lack of clarity around who is responsible for the treatment of OUD. Behavioral barriers identified by patients included: a focus on the present rather than the future, the necessity for important life events to pursue treatment, stigma, and mistrust of the health system.

EDs across the country play an important role in the care of patients with OUD, as these patients are often marginalized from traditional sources of primary care. MAT with buprenorphine has been shown to increase retention in treatment in patients after presentation to an ED and has been shown to reduce ongoing illicit opioid use, risk of overdose, and death. Appreciating the role they play in the care of patients with OUD, many EDs have begun starting ED-MAT programs including our own, which was the first ED in our state and among the first in the country to do so. Currently, more than 90% of our physicians are DEA-X waivered and able to prescribe buprenorphine but there is a low rate of MAT initiation in the ED, which is consistent with previous findings that many providers who obtain their DEA X waivers underutilize them. Through semi-structured interviews with 21 medical providers from the MGH ED we have identified four behavioral barriers impacting adherence to the MAT initiation protocol by providers. These include: time pressure, absent cues to ask about opioid misuse, uncertainty with treatment protocols, and varied ideas of who is responsible to treat opioid use. Through semi-structured interviews with 10 patients with OUD four barriers to accessing OUD treatment in our ED were identified. These included: a focus on the present rather than the future, the necessity for important life events to pursue treatment, stigma, and mistrust of the system. These barriers have become the foundation of a design and testing process to improve provision of MAT in our ED leading to the creation of interventions targeted at addressing them. The barriers identified from our program’s first year of operation may serve as useful lessons as other hospitals seek to operationalize their own MAT programs.

Keywords
Health Policy, Operations/Quality Improvement, Social Emergency Medicine, Substance Abuse/Toxicology
February Teach-Off Competition: A $60 Teaching Intervention to Beat the Winter Blues

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Innovation
Bedside teaching is an important aspect of resident education. Demands on faculty time with rising patient volume and ED overcrowding can threaten teaching. Academic centers have seasonal flow, in the summer we focus on interns assuming new roles and the spring on changing roles. For many faculty, the winter brings role fatigue and loss of focus on teaching. This unfortunately is when residents take the annual ACGME survey which measures resident perception of faculty teaching. We piloted a February Teach-Off Competition in 2018 to address this need and boost our teaching. The objectives were to: 1) increase participation in on-shift teaching, 2) recognize teaching excellence and 3) improve ACGME resident survey responses of faculty interest in teaching.
In January 2018, we promoted the competition. Goal was to encourage resident and faculty participation in morning rounds and change-of-shift teaching. We tracked rounds and reminded those responsible via email. At the end of February, residents voted anonymously on-line for the best resident and faculty teacher. All nominees were recognized at conference and directly with ED leadership. The winners received a framed certificate and gift card to a local café. The total program cost $60.
We expanded morning teaching rounds to 6 days per week and residents reported an increase in change-of-shift teaching. Fifteen residents and faculty were formally recognized for teaching. Our efforts did not lead to measurable improvements on the ACGME survey questions “faculty are interested in residency education” and “create environment of inquiry”. Mean scores 4.0 and 3.7 in 2018 respectively and 4.1 and 4.0 in 2017. This blunt survey may not be the correct tool to measure impact of this project. This program is applicable to any residency suffering from seasonal slumps in teaching enthusiasm. The program is low cost and easy to implement. Many residents and faculty who were not nominated this year asked how they could “make the winner list” next year. The award ceremony was met with cheers and was a fun celebration. It recognizes those who are dedicated to teaching and encourages others to compete for the same.

Keywords
Education, , ,

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Innovation
Mainstream representation in undergraduate medical education marks an essential step in recruiting students to a specialty. At our institution, formal EM education prior to fourth-year clinical electives was lacking. In 2015, a new one-year, team-based preclinical curriculum was introduced, creating an opportunity for a collaborative effort between students and EM faculty, with support from the SAEM EMIG Grant, to integrate EM into the first-year medical school curriculum.

(1) Prepare students for exposure to EM during the core clinical year. (2) Provide practical training in common clinical procedures. (3) Introduce high-yield EM topics using emergency-oriented conceptual frameworks (e.g., can’t miss diagnoses, rapid prioritization of tasks). (4) Foster mentorship and collaboration across training generations.

This student-developed curriculum was designed to mirror the institution’s overall curricular framework in five separate sessions. Two team-based sessions were dedicated to providing a basic EM approach to common medical problems. An additional two procedural skills sessions were offered in a simulation center by residents and attending physicians for students. Finally, a panel of EM physicians convened to inform students of current opportunities for networking and collaboration, as well as future career options in EM.

Participant responses over two-years show encouraging potential to prepare students for their upcoming clinical experience. At the most recent session, follow-up surveys completed by all eight participants show overall benefit, with the majority of the group reporting improved comfort performing six of the nine procedures covered.

As an increasing number of medical schools adopt a similar first-year curriculum, the opportunity to include a dedicated preclinical EM component is growing. This work highlights the importance and impact of EM as an integral core component of modern undergraduate preclinical medical education and can easily be incorporated into any institution’s first-year curriculum.

Keywords
Education, , ,
Peer-to-Peer Support Program: An Intervention to Foster Resiliency During Residency

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Innovation
Efforts to enhance resiliency are critical to provider wellness and burnout prevention in Emergency Medicine (EM). There is often a real or perceived stigma which prevents physicians from seeking help during stressful times. We sought to develop and implement a peer-to-peer support program to create a forum for dialogue around challenges faced by residents. We protocolized this intervention to build resiliency by creating accessible, reproducible resources and encouraging help-seeking behavior among EM trainees.

To develop and implement the EM ‘Peer-to-Peer Support Program’. This is a confidential, sustainable process which matches residents who may benefit from emotional support with trained EM resident peer supporters. This resident-led and facilitated program is designed to enable meaningful connections between coworkers who face similar personal/professional challenges and stressors. By normalizing peer assistance, we sought to create an institutional culture that reduces the stigma attached to asking for and receiving help during difficult times.

Based on review of similar peer support programs, we defined elements of an accessible and safe support system, created a structured peer supporter training protocol, developed a systematic approach for identifying potential beneficiaries (through event-driven automatic referral and self-referral procedures), matched residents with supporters, and created guidelines for the scope of the services supporters can provide. We collected data on utilization, preferences, and perceived effectiveness of trainings and interventions.

Our team identified the need to implement a support program for our residents that would enable trainees to efficiently find a peer to discuss personal or work-related stressors. Our goal was to utilize our shared experiences to promote a sense of community and to ultimately cultivate a culture of help-seeking, empathy, and solidarity among our residents. With the help of faculty members, the appropriate roles and limitations of supporters and criteria for escalation when residents were deemed too at-risk were explicitly defined. Highlighting existing institutional and local resources for residents, such as the availability of clinical psychiatrists and psychologists, proved essential to building a safe program. Initial data showed that all residents that utilized the program were referred after a sentinel event (eg: involvement in a medical error/malpractice case or case of a pediatric death). We did not have any resident who self-referred into the program, but residents did refer peers. Preliminary anonymous surveys revealed that participants who used it, found the program helpful and would use it again. Future goals include increasing the number of self-referrals. We hope to pursue interdisciplinary collaboration going forward and have already successfully implemented this program in a way that compliments hospital-wide approaches to supporting wellness. Our training model, procedures and guidelines may be helpful to others seeking to create similar programs. The quality of care we deliver to our patients ultimately depends on our well-being as physicians. By promoting resiliency and facilitating relationships within our specialty, we create a culture that celebrates empathy and humanity in medicine.

Keywords
Career Development, Education, 

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