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ABSTRACT

A Prospective Evaluation of Gender, HEART Scores, and Diagnostic Testing in Patients with Chest Pain

William Soares - University of Massachusetts Medical School - Baystate, Timothy Mader, Seth Gemme, Sai Guttikonda, Kye Poronsky

Background and Objectives:Females with acute coronary syndrome have historically been misidentified and received fewer diagnostic tests compared to males. It remains unknown how gender differences influence the HEART Score, an evidence-based clinical decision aid for emergency department (ED) patients with chest pain. We evaluated differences in the HEART Score to predict major adverse cardiac events (MACE) by gender, as well as differences in subsequent 30-day cardiac testing.

Methods:A prospective observational study was performed at a single tertiary center comparing ED providers’ HEART scores with standardized research 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. Patients were followed by phone and chart review at 6 weeks to evaluate for diagnostic testing (stress test and catheterization) as well as major adverse cardiac events (MACE) including myocardial infarction, bypass surgery, and revascularization. Nonparametric testing and logistic regression were used to evaluate outcomes.

Results:Over 24 months, 336 patients completed the study, including 159 (47%) females. Compared to males, a higher proportion of females received a low-risk HEART Score (31% vs 22%, Chi-Square p=0.07). Eight females (5%) and 22 males (12%) experienced MACE during the 30 day follow up. No participants identified as low risk by the HEART score experienced MACE. Females with high-risk HEART Scores (4+) had a lower 30-day MACE rate compared to males (7% vs. 15%). With regards to diagnostic testing, gender was not associated with the odds of receiving a stress test (OR 1.06, 95%CI 0.67-1.7). Men had higher odds of cardiac catheterization (OR 3.0, 95%CI 1.5-6.0), which remained significant despite controlling for elevated troponin and positive stress test (OR 6.25, 95%CI 1.2-33).

Conclusion:We found no differences in MACE in patients identified as low-risk by the HEART Score. Males had higher 30-day MACE rates, however, our findings are complicated by males having higher odds of cardiac catheterization, even when controlling for positive troponin and stress tests, which could inflate MACE rates via increased stent placement. Future multicenter studies are recommended to validate our single-center results.
ABSTRACT

An Epidemiology Study of Surfing: Increase Popularity, Injury Pattern, Evaluation of Gender Difference

Myungwook Bae - Baystate Medical Center, Nicholas Daniel - UMMS-Baystate Medical Center, benjamin Mattingly, Timothy Mader, Kye Poronsky

Background and Objectives: Surfing related injuries have been increasing over time. It is unclear whether patient characteristics, including gender, are associated with the type and severity of injury in patients that present to the emergency department (ED). We evaluated differences in the annual incidence of injury, stratified by sex, to evaluate for population level differences.

Methods: Data was acquired via the National Electronic Injury Surveillance System (NEISS) from 2009-2018. NEISS data is collected from approximately 100 hospitals that are selected as a probability sample of all U.S. hospitals with emergency departments. Charts with surfing-associated chief complaints were included. Injury prevalence was stratified by sex and compared using descriptive statistics.

Results: Over 10 years, a total of 1506 injuries were reported, including 311 (20.1%) females. Compared to males, females showed similar age pattern (18 – 84 vs 18 – 82, respectively). The incidence of serious injuries in both sexes was similar. Eight males (0.007%) presented as trauma patients in comparison to two females (0.007%). One male patient presented with cardiac arrest associated with surf injuries. No other significantly different outcomes were seen between the two gender groups.

Conclusion: We found no difference by sex with regards to injury type or severity based on emergency department chart review. Although surfing is thought to be more popular amongst male population, injury patterns are similar in female populations. Public safety campaigns to prevent surfing injuries should reflect common injuries and should not be gender specific.
ABSTRACT

Carrying the “10 Essentials” of Hiker Preparedness Does Not Translate to Improved Day-Hike Outcomes

Nicholas Daniel - UMMS-Baystate Medical Center, Peter St. Marie - Baystate Medical Center, Elizabeth Schoenfeld - University of Massachusetts Medical School - Baystate

Background and Objectives: Day hikers have been shown to be a poorly prepared group in terms of carrying preparedness items. The “10 essentials” of wilderness survival comprise a gear list that has remained a popular guide in wilderness preparedness since its inception, despite a lack of empiric evidence that carrying the “10 essentials” changes outcomes. We sought to better understand the value of the “10 essentials” in day hiker preparedness by assessing the relationship between carrying more items, adverse events occurring on the hike, and hiker satisfaction. We hypothesized that the overall number of items carried would not strongly affect outcomes, and secondarily, that some of the “10 essentials” could be prioritized for day hikers.

Methods: A cross-sectional convenience survey study was conducted at the Monadnock State Park Headquarters parking lot at the base of Mount Monadnock (Jaffrey/Dublin, NH) over 4 d during the 2016 spring-to-fall hiking season. Adult hikers finishing a day hike were invited to participate. The survey was developed based on current literature and designed to assess which of the “10 essentials” were carried, adverse events that occurred on the hike, and hiker satisfaction. Hikers were also queried whether they felt prepared for the adverse events that occurred with the “10 essentials” that they carried.

Results: A total of 961 hikers reported 1672 adverse events. Hikers reported they felt prepared in 89% of the events experienced. The most common adverse events reported were thirst (62%), hunger (50%), feeling cold (18%), and needing rain gear (11%). Carrying more of the “10 essentials” was associated with an increased likelihood of reporting any adverse event, as well as a decreased incidence of adverse events that the hiker was not prepared for, without a change in satisfaction rates.

Conclusion: Carrying more items of the “10 essentials” did not translate into improved satisfaction for day hikers, but was associated with fewer events for which the hiker was unprepared. Other than hunger, thirst, and weather issues, adverse events are very unlikely during a day hike on a popular well-traversed mountain. Based on reported need, nutrition, hydration, and insulation could be categorized as priority items, while the remaining seven essentials were infrequently needed.
ABSTRACT

Emergency Providers’ Perspectives on Addressing Health Related Social Needs in the ED

Andrew Kerrigan - LAC+USC Medical Center, Peter St. Marie - Baystate Medical Center, Elizabeth Schoenfeld - Baystate Medical Center

Background and Objectives: There is no formal research on emergency provider perspectives on addressing health related social needs (HRSN) in the ED. Our objectives are to describe the frequency with which providers believe care is impacted by HRSN, providers’ perspectives on their role addressing HRSN, and facilitators/barriers to addressing HRSN in the ED.

Methods: Using the Theory of Planned Behavior, we designed an online cross-sectional survey via expert panel input and cognitive interviews. Eligible participants were MDs, DOs, and advanced practice providers (APPs) practicing in a US ED. Our target was 500 responses from convenience sampling of professional EM networks, as well as residency sampling via random sampling. Quantitative data was analyzed via descriptive statistics.

Results: 643 participants started the survey, and 193 stopped answering when it was clear the study was about HRSN, for a total of 450 complete surveys. One-fifth (22%) were residents, 41% attendings, and 35% APPs. Mean age was 40 with 64% female and 85% white. When ranking issues that impact their patients, 79% identified access to care, followed by poverty (70%), literacy (36%), housing (32%), transportation (30%), language barriers (16%), safety (12%), and food insecurity (10%). One third (30%) felt addressing social issues was not their responsibility while 16% felt it was very much their responsibility. “Language barriers” was most commonly identified as the clinician’s responsibility (48%), while poverty was the least commonly endorsed (3%). One-third (31%) were “often” or “always” able to address issues if clinical care was impacted. If care was not affected, this dropped to 5%. The majority (64%) were “generally not able” or “occasionally able” to access resources. Training was the lowest desired resource (27%) and follow-up care was the highest (93%).

Conclusion: This is, to our knowledge, the first study to describe emergency providers’ views on addressing HRSN in the ED. As 30% quit the survey at introduction of the topic, we inferred that many EM providers were not interested in discussing HRSN. Perceived impact on care differed widely by individual issue. Direct impact on care increased participants’ sense of ability to address HRSN. Although many providers felt HRSN were not their responsibility, this varied by issue. Resource levels were low, and most providers felt that they needed more support, but few felt more training would be helpful.
ABSTRACT

Identifying Opportunities for Buprenorphine Induction in the Emergency Department: A Retrospective Chart Review

Caitlin Farrell, Ashley Deutsch, William Soares - Baystate Medical Center

Background and Objectives: Buprenorphine initiated from the emergency department (ED) for patient with Opioid Use Disorder (OUD) decreases future opioid use and increases follow up. As such, many EDs have implemented buprenorphine treatment protocols, with variable success. The objective of this quality improvement project was to identify rates of buprenorphine induction as well as missed treatment opportunities at a single academic ED that recently enacted buprenorphine treatment protocols.

Methods: A retrospective chart review was conducted of patients discharged from the ED with opioid use disorder or opioid withdrawal from August to September 2019 in an urban, academically affiliated ED, 3 months after formal enactment of buprenorphine treatment protocols. Patients discharged from the ED with ICD-10 codes for OUD (F11, T40.0, T40.1, T40.2, T40.3, T40.4, T40.6) who were not already on buprenorphine were eligible. Medical records were evaluated by a single reviewer for documentation of offering and patient acceptance of substance use disorder (SUD) evaluation and/or buprenorphine prescription, reception of buprenorphine prescription, and establishment of follow up care. Data were categorized and summarized descriptively.

Results: Over the 2-month study period, 65 electronic health records were reviewed. Of those, 19 patients were identified as eligible for a buprenorphine prescription. Exclusion criteria for buprenorphine included altered mental status (3), not active OUD (26), already using buprenorphine or methadone (7) or other causes such as using prescribed opioids, denying opiate use, or undocumented chronicity of OUD (10). Overall, 2 patients (10.5%) of those eligible were offered a buprenorphine prescription without a SUD evaluation and 6 patients (31.5%) were offered both a buprenorphine prescription and a SUD evaluation. Taken together, 8 patients out of the 19 eligible patients (42%) were offered buprenorphine. Of those offered buprenorphine, either in conjunction with a SUD evaluation or independently, 3 patients accepted.

Conclusion: Less than half of patients eligible for buprenorphine from the ED were offered buprenorphine and only 3 accepted treatment. Our retrospective chart review quality improvement project suggests that both continued provider education as well as further addressing patient level myths and barriers may help improve rates of buprenorphine treatment from the ED.
ABSTRACT

Outpatient Management of Patients Following Diagnosis of Acute Pulmonary Embolism

Lauren Westafer - University of Massachusetts Medical School - Baystate, Peter Lindenauer - University of Massachusetts Medical School - Baystate, Mihaela Stefan - University of Massachusetts Medical School - Baystate

Background and Objectives: While guidelines recommend outpatient management of patients with low-risk pulmonary embolism (PE), little is known about the disposition of patients with PE diagnosed in United States (US) Emergency Departments (EDs). We sought to determine the percentage of patients with acute PE discharged home from the ED and describe subsequent healthcare utilization and variation in disposition practices across institutions.

Methods: This was a retrospective cohort study of adult ED patients with a new diagnosis of acute PE treated at 740 US acute care hospitals from July 1, 2016, through June 30, 2018. Patients were identified via the combination of International Classification of Diseases, Tenth Revision codes for PE, a Current Procedural Terminology code for diagnostic imaging for PE, and a code for anticoagulation or inferior vena cava filter. The primary outcome was the initial disposition following an ED visit for acute PE. We developed a generalized linear mixed model for discharge and computed the median odds ratio (MOR) to quantify the relative contribution of hospital practice patterns related to outpatient management in comparison to patient-level covariates. We also assessed cost and 30-day revisit rates.

Results: A total of 61,090 cases were included. Overall, 7.5% of new PE cases were discharged from the ED. The patient factors most strongly associated with the decision to not discharge patients with acute PE were a concurrent diagnosis of respiratory failure/hypoxia (OR 0.21; 95% CI 0.19, 0.24), shock (OR 0.43; 95% CI 0.10, 0.77), hypotension (OR 0.35; 95% CI 0.24, 0.47), heart failure (OR 0.30; 95% CI 0.24, 0.34), anticoagulant use (OR 0.66; 95% CI 0.59, 0.74), or malignancy (OR 0.49; 95% CI 0.42, 0.55). The median hospital discharge rate was 5.3% (IQR 1.9, 13.7). The MOR, representing the importance of the hospital in initial disposition decisions, was 3.89 (95% CI 3.52, 4.27), stronger than all other factors other than the presence of heart failure or respiratory failure/hypoxia. Nearly one-quarter of discharged cases had a return visit within 30 days, of which 35.2% resulted in hospital admission. Among all return visits, 2.5% had a bleeding-associated diagnosis.

Conclusion: Few patients with acute PE are currently discharged home; however, practice varies widely between hospitals. Return visit rates were high but most did not result in hospitalization.
ABSTRACT

Trends in Medications for Opioid Use Disorder among Patients Hospitalized with an Injection Related Disease.

William Soares - University of Massachusetts Medical School - Baystate, Peter Friedmann, Peter Lindenauer - University of Massachusetts Medical School - Baystate, Mohammad Kamal Faridi - University of Massachusetts Medical School - Baystate, Penelope Pekow

Background and Objectives: Injection related diseases (IRD) in patients with opioid use disorder (OUD) continue to increase in the US. Medications, including methadone and buprenorphine (MOUD), are highly effective treatments, yet historically are infrequently administered to admitted patients. We analyzed trends in hospitalizations for IRD and the use of MOUD among patients with OUD and identified patient factors associated with receipt of MOUD.

Methods: We included patients 18 years and older hospitalized between 2009-2017 with an ICD-9-CM or ICD-10-CM diagnosis of OUD and at least one IRD condition, (opioid overdose or withdrawal, endocarditis, sepsis/bacteremia, osteomyelitis, skin / soft tissue infection, spinal/cranial abscess, HIV, or Hepatitis C). MOUD was defined as any administration of buprenorphine or methadone during hospital admission. Trend analyses were limited to hospitals with consecutive reporting of admissions from 2009-2017 and utilized logistic regression with GEE to account for within-subject effects using the year as a continuous variable. Similarly, factor analysis included data from 2016 to mid-2018 to identify factors associated with receipt of MOUD.

Results: Admissions for OUD and IRD at 215 hospitals increased 300% from 9,141 admissions in 2009 to 27,743 in 2017. Over the same period, the percentage of patients receiving MOUD decreased from 28% of admissions in 2009 to 22% in 2017 (absolute change -6%, p<0.001). Factors associated with higher odds of receipt of MOUD include female gender (OR 1.14, 95%CI 1.10-1.18), Hispanic ethnicity (OR 1.17, 95%CI 1.08-1.27), Medicaid (OR 1.62, 95%CI 1.54-1.71), Hepatitis C (OR 2.10, 95%CI 2.02-2.18), and HIV (OR 1.33, 95%CI 1.20-1.48). Age over 60 (OR 0.73, 95%CI 0.69-0.78), Opioid Overdose (OR 0.30, 95%CI 0.29-0.32), endocarditis (OR 0.90, 95%CI 0.86-0.96), and sepsis/bacteremia (OR 0.78, 95%CI 0.75-0.81), were associated with lower odds of MOUD administration.

Conclusion: Despite a three-fold increase in admissions, the proportion of patients with OUD and IRD treated with MOUD has decreased over time. Further, high-risk diagnoses, including overdose, endocarditis and sepsis/bacteremia are associated with lower odds of MOUD treatment. Our study highlights the continued limited availability of MOUD for patients with OUD.
ABSTRACT

Variation in Medication for Opioid Use Disorder Use among Patients Hospitalized with Injection Related Diseases.

William Soares - University of Massachusetts Medical School - Baystate, Mohammad Kamal Faridi - University of Massachusetts Medical School - Baystate, Penelope Pekow, Peter Lindenauer - University of Massachusetts Medical School - Baystate, Peter Friedmann

Background and Objectives: The opioid epidemic has triggered an increase in hospitalizations for injection-related diseases (IRD). Medications for Opioid Use Disorder (MOUD) decrease future opioid use, hospital readmission, and death, yet little is known about the prevalence and hospital-level variability of MOUD administration in IRD admissions.

Methods: We included all hospitals in the Premier Database with 25 or more admissions containing an ICD-10-CM discharge diagnosis of OUD [F11] and at least one IRD condition, including opioid overdose or withdrawal, endocarditis, sepsis/bacteremia, osteomyelitis, skin / soft tissue infection, spinal/cranial abscess, HIV, or Hepatitis C from January 2016 until June 2018. The primary outcome was the administration of methadone or buprenorphine at any time during hospitalization. We computed hospital-specific rates of MOUD treatment and evaluated associations with hospital characteristics. We developed a hierarchical generalized logistic model, adjusting for patient and hospital variables, to compute a median odds ratio (MOR) to quantify the contribution of the hospital on the odds of a patient receiving MOUD.

Results: Of 451 hospitals, 412 reported 25 or more admissions for OUD and IRD. Overall, 22% of admissions received MOUD (26,524 of 118,680 cases) of which 76% (20,236) received methadone and 24% (6,283) received buprenorphine. Rates of MOUD prescribing varied widely between hospitals, ranging from 0-89% of eligible admissions. Hospital-level factors associated with higher rates of MOUD treatment included urban (16%, IQR 11%-25% vs rural, 12%, IQR 8%-21%), teaching (19%, IQR 13%-29% vs non-teaching, 14%, IQR 9%-21%), geographic Northeast (28%, IQR 18%-40%) and with 200+ beds (17%, IQR 11%-26%). After adjusting for hospital and patient-level factors, the influence of the individual hospital system on odds of MOUD administration remained significant (MOR 1.93, 95%CI 1.82-2.03).

Conclusion: Rates of MOUD administration vary widely between US hospitals; at most institutions, fewer than 1 in 4 patients admitted with an IRD receive MOUD. Our results highlight an opportunity to improve patient care by addressing the barriers that promote significant hospital system variability in MOUD administration for patients with OUD and IRD.
INNOVATION

Opioid Use Disorder Harm Reduction Care Packages in the ED

Jonathan Gammel; Liz Whynott; William Soares

Intro/Background: Thousands of patients have died due to complications related to opioid use disorder (OUD), including overdose and infections. While many emergency departments (ED) now offer treatments for OUD, including medication, recovery coaching and structured evaluations, these therapies may miss high-risk patients who are not ready or able to immediately engage in treatment. Further, busy ED physicians may lack time to appropriately describe options to patients with OUD who are not interested in treatment.

Purpose/Objective: Our goal was to provide inexpensive, comprehensive, widely available harm reduction supplies and information to all ED patients with OUD including patients who were pre-contemplative for change or otherwise unable to engage with treatment. Additionally, we paired harm reduction kits with a structured follow up system to ensure that patients with OUD who received harm reduction supplies were contacted after their ED visit to reassess willingness to begin treatment.

Methods: In conjunction with Tapestry, a community health and syringe access program, we created inexpensive ED harm reduction kits, including safe injection supplies (sterile saline, alcohol prep pads, cookers, cotton filters) and information on OUD and safe injection practices. Harm reduction kits were placed in the ED and could be given by any ED staff member. Kit delivery was recorded via a patient sticker log book. All patients who received a kit were called after discharge.

Outcomes (if available): Over the past month, 10 harm reduction kits were distributed to ED patients including to 8 patients who initially refused ED based Buprenorphine treatment. ED technicians and mental health staff gave 8 of 10 kits. Of the 8 patients who refused buprenorphine in the ED, on phone follow up, 2 (25%) were interested in buprenorphine after ED discharge and were connected to outpatient resources.

Summary: Many patients in our ED struggle with opioid use disorder. Some of these patients may not be ready or able to engage in treatment offered in the ED. We set out to establish a harm reduction treatment approach specifically to assist patients who may refuse treatment and continue to use opioids after being discharged. In conjunction with local community resources, we created ED based harm reduction kits that are safe for all patients (including patients on a psychiatric hold), inexpensive, and contain both harm reduction supplies and information. Paired with harm reduction kits, we have implemented a distribution system that empowers non-physician ED staff to circulate kits to patients. Further, patients who receive kits are contacted via phone after discharge, which has resulted in identifying an additional 25% of patients ready to begin medication therapy for OUD.
ABSTRACT

A Nationwide Survey of Program Directors on Resident Attrition in Emergency Medicine

Andrew Mittelman - Boston Medical Center, Madeline Palmer - Boston Medical Center, Julianne Dugas - Boston Medical Center, Kerry McCabe - Boston Medical Center, Jordan Spector - Boston Medical Center, Alexander Sheng - Boston Medical Center

Background and Objectives: Background: An average of 23% of emergency medicine (EM) training programs are impacted by attrition each year, resulting in a significant burden on programs and trainees. Little research exists to elucidate who is at risk of leaving prior to completion of EM residency, or the factors that are associated with attrition. We aim to conduct the first national survey of EM program directors (PDs) to characterize reasons behind and risk factors for resident attrition in EM. Our primary objectives are to quantify resident attrition in EM training programs and to query the perceived reasons for attrition, from a PD perspective. Our secondary objectives are to describe demographic characteristics of residents undergoing attrition, personal factors associated with attrition, and the avenues of resident replacement.

Methods: Methods: We conducted a national survey study of all EM PDs during the 2018-2019 interview season. PDs were asked to identify all residents who left their program prior to completion within the last four academic years (2015-2016 to 2018-2019), provide relevant demographic information, and select perceived reasons for attrition. Frequencies, percentages, proportions, and 95% confidence intervals were obtained for relevant program- and resident-specific demographics. Fisher’s Exact tests were performed to compare reasons for attrition between age groups.

Results: Results: A total of 118 of 217 PDs who received our recruitment email completed the questionnaire (response rate of 54%). During the four-year study period, 39 of the 118 programs (33%) experienced at least one resident attrition. A total of 52 residents underwent attrition. Residents undergoing attrition were more likely to be early in training. Gender was not associated with attrition. Older residents were more likely to leave due to perceived academic challenges. The most common reason for attrition was to switch specialties. Resident replacement was found in 42% of cases.

Conclusion: Conclusion: EM PDs reported that nearly one-third of residencies were affected by resident attrition. Most demographic patterns associated with attrition in other specialties were not observed in the results of our national survey in EM. Further rigorous qualitative research is necessary to better illustrate PD and resident perspectives on the impact of and reasons behind resident attrition.
ABSTRACT

Evaluation of race and ethnicity as barriers to inpatient treatment for opioid use disorder

Jessica Faiz, Edward Bernstein, Julianne Dugas - Boston Medical Center, Kerrie Nelson, Elissa Perkins, Lauren Nentwich, Joseph Pare

Background and Objectives: Opioid use disorder (OUD) is a national epidemic; over 2 million people are diagnosed annually and deaths surpass 130 people daily. Compared to non-Hispanic Whites, Blacks and Hispanics are less likely to use services for substance use disorder and have reduced linkage to maintenance therapy. Our objective was to identify if being non-White (Black or Hispanic) is a barrier to inpatient treatment for OUD among patients who also had an ED visit for an OUD related complaint.

Methods: We performed a retrospective cohort study from 7/1/2018 – 9/30/2019. We identified ED patients with visits for an opioid-related ICD-10 code. Charts were analyzed if patients had an encounter with a licensed counselor for OUD. Data from standardized counselor’s notes were abstracted electronically and analyzed to determine whether the patient sought placement and whether a barrier to placement was faced and the patient wasn’t placed. Patients without age or race documented were excluded. A generalized linear mixed model was used to assess the association between non-White race and treatment barrier. A fully adjusted model was produced controlling for multiple visits per patient, age, sex, insurance, time, day of week, and time of year.

Results: We identified 1,733 encounters for connection to inpatient treatment for OUD. Of those, 45% represented non-White patients. Non-White patients showed a nonsignificant trend toward being less likely to face a barrier than White patients in the unadjusted and adjusted models (OR 0.78, 95%CI 0.60 – 1.00, OR 0.82, 95%CI 0.65 – 1.04). Factors associated with a barrier were female sex (OR 1.48, 95%CI 1.11 – 1.97), visit between 4pm-7pm (OR 1.84, 95%CI 1.38– 2.46) or 8pm-6am (OR 5.02, 95%CI 3.75 – 6.72). Patients with Medicaid were less likely to face a barrier (OR 0.49, 95%CI 0.25-0.95).

Conclusion: Our results show a non-statistically significant trend towards non-White patients having fewer barriers to inpatient treatment placement. We suspect this unusual result is due to our institution’s diverse team of OUD counselors. Female sex, insurance, and time of presentation are barriers that require further attention to improve linkage to treatment. This work provides evidence that being non-White is not a significant barrier to inpatient OUD treatment, however other variables should be scrutinized to promote equitable care for patients with OUD.
ABSTRACT

Hyperglycemia Management in the Emergency Department Prior to Admission

Lauri Cashman - Boston Medical Center, Meissane Benbrahim - Boston Medical Center, William Baker - Boston Medical Center, Patrick Ryan - Boston Medical Center, Bryan Gendron - Boston Medical Center, Sara Lookabill - Boston Medical Center, Natalija Farrell - Boston Medical Center

Background and Objectives: Current American Diabetes Association guidelines recommend the use of insulin-based treatment in hospitalized patients to achieve a blood glucose 250 mg/dL to <20% in order to improve patient outcomes.

Methods: A workgroup of ED physicians, pharmacists, and endocrinologists are collaborating to standardize the management of hyperglycemia in the Boston Medical Center (BMC) ED. In January 2019, an insulin order set was released for ED providers and education was provided. In June 2019, an Electronic Health Record (EHR) report was created that captures all patients in the ED with a blood glucose >200 mg/dL. Pharmacy staff then prompts providers to treat the hyperglycemia. In January 2020, an insulin dosing protocol based on the rule of 1500 will be available to ED providers. Based on feedback from ED staff, a protocol for hyperglycemia treatment will be developed. Outcome measures for this project include average blood glucose reduction, hospital LOS, in hospital mortality, and in hospital DKA/HHS. The balancing measure is hypoglycemia (blood glucose <70 mg/dL). Data will be collected prospectively and continuous feedback will be obtained from staff.

Results: Since the introduction of the EHR report and pharmacy prompting providers to treat hyperglycemia, there has been an improvement in the average blood glucose reduction of patients admitted from the ED by over 50%. Expected results moving forward include a reduction in the amount of patients admitted with a blood glucose >250 mg/dL upon arrival to the floor, and hospital LOS in these patients.

Conclusion: Implementation of an EHR report for ED patients with hyperglycemia, and subsequent prompting of providers to treat with insulin, has resulted in an improvement in blood glucose reduction in admitted ED patients.
ABSTRACT

Invisible Wounds: Adverse Posttraumatic Neuropsychiatric Sequelae (APNS) Among Patients Discharged from 29 EDs

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Background and Objectives: One-third of ED visits are for an evaluation after a traumatic injury or exposure and more than 90% are discharged from the ED. EDs routinely provide advanced interventions for visible wounds from trauma, but screening and treatment for the “invisible wounds” of adverse posttraumatic neuropsychiatric sequelae (APNS) is not standard practice. As a first step towards addressing this deficit, we aimed to estimate the short-term incidence of symptoms of APNS among ED patients who sustained a traumatic injury or exposure.

Methods: AURORA is a longitudinal, observational study of patients from 29 US EDs who sustained a traumatic injury or exposure. Eligibility criteria are age ≥18 years, English-speaking, not pregnant, and with smart phone access for follow-up. Participants were surveyed using standardized instruments at ED enrollment and at 2 and 8 weeks post-enrollment for the presence of moderate or severe APNS: depressive symptoms (DS, PROMIS Short Form 8b ≥60), posttraumatic stress symptoms (PTSS, PCL-5 ≥28), somatic symptoms (SS, ≥3 somatic symptoms ≥2 points higher than reported baseline), and pain symptoms (≥4 on 0-10 NRS).

Results: Of the 1,618 AURORA participants, most were female (64%), non-white (67%), and their mean age was 35.4 years (SD 13.05). 1255 (78%) experienced motor vehicle collision, 155 (10%) were physically assaulted and 1546 (95%) were discharged home after their ED evaluation. Two weeks after discharge, 88% reported one or more moderate/severe APNS symptoms, and 72% reported two or more moderate/severe APNS symptoms. The most common APNS were moderate or severe pain (79%), somatic (72%), posttraumatic stress (53%), and depressive (30%) symptoms. At 8 weeks follow up, 81% of participants continued to report one or more moderate/severe APNS and 62% reported two or more moderate/severe APNS symptoms. The most common APNS 8 weeks post-enrollment were moderate or severe pain (65%), somatic (66%), posttraumatic stress (49%), and depressive symptoms (27%).

Conclusion: Among ED patients evaluated after trauma and discharged home, symptoms of APNS are the norm two months after their ED visit. Screening and treatment for these “invisible wounds” are necessary to meet this unmet need.
ABSTRACT

Non-White Patients Are More Likely to Present Repetitively for Opioid Use Disorder Treatment

Jessica Faiz, Edward Bernstein, Juliane Dugas - Boston Medical Center, Kerrie Nelson, Elissa Perkins, Lauren Nentwich, Joseph Pare

Background and Objectives: Emergency departments (ED) serve as the entry-point to health care for many vulnerable populations, and are often the first step in connection to treatment for opioid use disorder (OUD). OUD has high relapse rates after treatment, and unfavorable disparities have been shown in treatment completion and relapses for women, Latinos, and Blacks. Our urban ED has a dedicated substance and OUD counseling and treatment referral section, Project Assert. This study aims to identify whether non-Whites (Black or Hispanic) who had an ED visit for an OUD related complaint are more likely than Whites to present multiple times for connection to inpatient treatment.

Methods: We performed a retrospective cohort study between 7/1/2018 – 9/30/2019. We identified ED patients with visits for an opioid-related ICD-10 code. Charts were analyzed if patients had an encounter with a licensed counselor for OUD. Patients without age or race documented were excluded. We excluded patients who were not Hispanic, Black or White as these patients made up a very small number. Patients were categorized based on non-White (Black or Hispanic) and White. Patients were considered as having high utilization if they sought placement to inpatient detox more than 3 times during the study period. The proportion between White and non-White patients with more than 3 visits for OUD placement was assessed by a binomial test, producing a z-score.

Results: After exclusions, 782 unique patients presented for connection to inpatient treatment for OUD which resulted in 1,733 encounters. Of the 782 patients, 40.5% were non-White and 59.5% were White. Of the 782 patients, 121 patients (15.5%) presented more than 3 times and were referred to inpatient treatment for OUD. While non-White patients comprised only 40.5% of the entire sample, the percentage of patients with more than 3 visits that were non-White, 50.4%, was significantly different (Z = 2.21, p = 0.027).

Conclusion: Non-White patients are more likely to present multiple times for connection to inpatient treatment for OUD than Whites. This may suggest non-Whites are more comfortable seeking care after relapse, or more disparities exist compared to Whites once they leave the ED leading to higher relapse rates. Further work is needed to determine why Black and Hispanic patients are higher utilizers and have more frequent requests for referral to OUD treatment.
ABSTRACT

Providing Transportation to Outpatient Appointment Does Not Improve Linkage-to-Care for Patients with Hepatitis C

Jessica Faiz, Katy Scrudder, Glorimar Ruiz-Mercado, Angelica Chan, Fiona Shea, Elissa Perkins

Background and Objectives: Hepatitis C virus infection (HCV) has become a routinely treatable condition. Screening and linkage-to-care are now the limiting factors in its treatment. In the Emergency Department and outpatient clinics of our urban, safety net hospital we instituted a successful screening program which we previously reported. Patients that screen positive for HCV are notified by patient navigators, and linked to outpatient treatment. Linkage-to-care for HCV treatment however remains suboptimal at approximately 30-40%. The objective of this study was to assess whether addressing transportation barriers with taxi vouchers would improve the linkage-to-care rate.

Methods: We conducted a prospective randomized controlled trial enrolling HCV positive patients between 04/2018 – 08/2018. The patient navigator used a standardized dialogue with all patients. Patients who identified transportation as a barrier were randomized to either receive, or to not receive a round-trip taxi voucher to their appointment. Reminder calls were made regardless of randomization. Subjects who received a voucher had an additional contact the morning of their appointment to confirm ride details. Whether the patient attended or did not attend their appointment was retrospectively assessed via EMR.

Results: 239 HCV positive patients were contacted and only 89 patients were reached. No eligible patients identified a transportation barrier during the first 3 months of the study. At this point, we offered taxi vouchers to all patients. One patient accepted the transportation voucher and attended their appointment. Reasons for declining a voucher included: receiving transportation through Medicaid, requiring an ambulance, difficulty identifying pickup point for taxi due to homelessness, walkable distance to the clinic, or already having a car.

Conclusion: In an urban, safety net hospital, provision of taxi vouchers did not improve rates of linkage to care for patients with HCV. Patients overwhelmingly did not identify a transportation barrier which may be due to many patients living within walking distance. Other barriers such as homelessness, lack of a working phone, and intravenous drug use seem to supersede transportation. Further studies must be conducted to better evaluate what linkage-to-care barriers exist for these patients so that they can be treated for their chronic diseases.
ABSTRACT

What is the Status of Gender Equity in Academic EM Leadership?

Judith Linden - Boston Medical Center, Kirsten Rounds - Brown Emergency Medicine, Tracy Madsen - Alpert Medical School of Brown University, Janette Baird, Andrea Fang - Stanford University, Michelle Lall, Michelle Lin - Icahn School of Medicine at Mount Sinai, Neha Raukar, Kinjal Sethuraman, Valarie Dobiesz

Background and Objectives: Background: Women constitute 36% of EM residents and 36% EM faculty in academic EDs. Women remain underrepresented in academic leadership positions - only 15% of EM chairs are women. Change in the gender distribution of EM leadership positions over time or in specific leadership domains has not been studied, and little is known about the clinical hours of leaders in academic EM by gender. We sought to analyze leadership composition, and compare annual base clinical hours in academic EDs by gender, as reported in the Association for Academic Chairs in Emergency Medicine Benchmark Survey (AACEM-BS).

Methods: Methods: We analyzed the gender composition of faculty in EM leadership positions utilizing the AACEM-BS data from 2015-2018. Leadership positions were categorized as executive (chair), operations, education, research or none. Leadership positions were further stratified to tiers (Senior: chair, operations director, program director, Mid level: vice/associate, and Junior: assistant). The odds of being in any leadership role and in specific roles by gender after controlling for academic vs community site, academic rank, years at faculty, and survey year were calculated using multiple logistic regression. We tracked leadership gender distribution over time, and annual base clinical hours.

Results: Results: 8632 individuals were included; 2852(34%) were women. Women had significantly fewer years as faculty compared with men: mean 9.1 (SD 7.3) vs 12.6 (9.2), held lower academic rank, and were more likely to have an educational (OR 2.4, 95%CI:1.98-2.84) and less likely to have any leadership role (OR 0.75, 95%CI: 0.66-0.84). Over all time periods, women were less likely to hold operational (OR 0.53, 95%CI: 0.44-0.64) or executive roles (OR 0.72, 95%CI: 0.59-0.88). In the multivariate model, among those in leadership roles, women occupied similar tiers of leadership positions. There was no significant change in percentage of women leaders over time. Annual base clinical hours of leaders were not significantly different by gender.

Conclusion: Conclusion: Women were less likely to hold EM leadership positions with the exception of education roles. Among leaders, however, women occupied similar tiers of leadership and had similar base clinical hours. These findings reinforce the lack of progress and need for sponsorship and interventions aimed at increasing the promotion of women into leadership roles.
A Focused, Interactive Bootcamp For Medical Students Entering Emergency Medicine Residency

Adam McFarland; Stephanie Stapleton

Intro/Background: The transition from medical school to internship has a steep learning curve. Recent literature has supported the use of educational bootcamps for interns to provide foundational specialty-specific content and address variability in skills of incoming residents. To our knowledge, few data have been reported addressing the utility of such an intervention in Emergency Medicine (EM)-bound students.

Purpose/Objective: The main objectives of the boot camp were to: 1) Increase confidence and improve proficiency in common procedures including central venous access, splinting, and bag-valve oxygenation among others 2) Expand medical knowledge for both resuscitation and basic patient management 3) Increase self-confidence in leading and managing simulated medical resuscitation

Methods: Fourth-year medical students applying into EM residency participated in an ungraded, 2-day course in preparation for intern year. The bootcamp used interactive presentations, procedural workshops, high-fidelity simulation scenarios, and a simulated night on-call. This combination of educational modalities facilitated integration of knowledge-based learning, kinesthetic practice, and experiential learning with reflective debriefing. Student self-confidence ratings were collected using pre- and post-evaluations on a 100-point scale. Overall bootcamp value was ranked on a mean 5-point Likert scale.

Outcomes (if available):

Summary: A total of 18 students participated, with 10 attending both days. Students noted significant improvement in confidence as a resuscitation team leader (18%, p < 0.04), prescribing narcotic pain medications (25%, p < 0.00), placing an upper extremity splint (36%, p < 0.00), inserting a central line (31%, p < 0.01), selecting equipment (18%, p < 0.00) and medications (25%, p < 0.00) for intubation, and choosing appropriate oxygenation devices for the hypoxic patient (21%, p < 0.00). Students agreed the bootcamp was good preparation for intern year (4.9), fun (4.7), increased clinical self-confidence (4.1), and should be required curricula for graduating medical students (4.4). This 2-day EM bootcamp was well-liked by students and resulted in improved self-confidence in procedural skills, medical knowledge, communication, and teamwork.
INTRODUCTION

Medical Hackathons as a Tool to Promote Interdisciplinary Collaboration and Medical Innovation

Sina Mostaghimi; Zaid Altawil

Intro/Background: Empathy and collaboration are keys to impactful innovation. Engineers and computer scientists use design thinking as a framework for empathetic innovation, and hackathons as a mechanism to collaborate. Hackathons focus on solving a specific challenge, with the goal of rapidly producing a prototype. Our team recognized hackathons can develop qualities lacking in medical and undergraduate education, such as interdisciplinary collaboration, empathetic design, rapid prototyping, and consequence free thinking, so we developed one for emergency medicine.

Purpose/Objective: Our objective is to show the impact hackathons can have on undergraduate and graduate students in the development of interdisciplinary collaboration and design thinking. Although the goal of students participating in hackathons is to solve a challenge, the longer lasting impact is a further appreciate empathetic problem solving, interdisciplinary collaboration, and design thinking.

Methods: Our hackathon was focused on solving challenges in emergency medical care. It was developed by the co-authors of this publication in collaboration with undergraduate and medical students. The hackathon was a weekend-long, overnight event where students chose one of several problems presented to them within one of the following categories: Patient Experience, Social Determinants of Health, Product Development. Students presented their solutions and received feedback for improvement by a panel of expert judges.

Outcomes (if available):
Summary: Innovation in medicine is difficult. We often battle archaic systems and tools and heavy bureaucracy in our day-to-day work in the Emergency Department. This mentality breeds apathy, which is why our team looked to hackathons to break this pattern. Hackathons are invention marathons that use design thinking, rapid prototyping, and empathetic thinking to solve complex problems. Hackathons are used in industry as a tool to promote creative problem solving by breaking the traditional mold of accountability for ideas and forcing participants to think out of the box. In our prior lives as engineers we recognized the most difficult part of developing a new medical product is identifying important problems, and when solved recognizing if we developed a practical solution. Now, as resident physicians we are aware of system and product inadequacies, but are without the skills to solve them. We developed hack/ED, a medical hackathon focused on solving challenges in Emergency Medicine, to promote interdisciplinary collaboration, empathetic design, and medical innovation. The hackathon was open and free to all students - from undergraduate to graduate students of all fields, including medical and non-medical. The purpose of hack/ED was to bring students with diverse skill-sets together to solve problems and recognize the impact that can be had by collaborating for even a short period of time. Post-event data was collected and showed hack/ED accomplished what it sought out to do. All students that responded felt more appreciation for the importance of interdisciplinary communication, 36% plan to continue working on their projects, and 85% plan to pursue future projects in medical innovation, most with no medical background. Hack/ED proved hackathons can be tools for innovation in medicine and to promote interdisciplinary collaboration, areas that are crucial to any medical careers, particularly those in emergency medicine.
Novel Wearable Abscess Model

Stephanie Stapleton

Intro/Background: Abscess incision and drainage is a common procedure performed by emergency medicine physicians. Currently, there are no commercially available abscess models that allow for incision and drainage. There are a few novel models that can be made prior to a teaching session but all are on a non-mobile base. This allows for very basic skills practice but leaves out much of the finer points or patient placement, professional ergonomics, patient reassurance and redirection.

Purpose/Objective: The first objective was to create a novel wearable abscess model that is quickly assembled from readily available items. The second objective was to test learner willingness to wear the abscess. This innovation is the first step in a longer study to compare learner performance in a wearable vs typical stationary abscess model.

Methods: Abscesses were made of a balloon filled with moulaged pus placed in a hallowed cosmetic sponge. Volunteers protected their arms with Kevlar sleeves covered with cling wrap. The abscess was sandwiched between the wrapped arm and a tattoo practice pad. Learners then “numbed the area” while injecting into the sponge. They incised the “abscess” and broke up any loculations. Abscess wearers were encouraged to fully act the part of a patient terrified of the procedure.

Outcomes (if available):

Summary: This is a novel wearable abscess model that is quickly assembled from readily available items. Learners were willing to wear the abscess and act as patients.
INNOVATION

The “favorite patient” exercise: a non-confrontational curriculum to address bias in emergency medicine students

Sarah Kleinschmidt; Laura Welsh; Adam McFarland

Intro/Background: Provider bias is pervasive and contributes to both healthcare disparities and provider burnout. However, no specific curricula exist for EM-bound medical students, missing a critical period of clinical and professional development. In addition, direct training about implicit bias has been shown to increase cognitive and affective dissonance, limiting further reflection and growth. Therefore we created a brief, non-confrontational and discussion-based curriculum about bias aimed at EM-bound students.

Purpose/Objective: Our goal was to increase awareness of and ability to manage bias, while also nurturing ongoing reflection and personal growth in EM-bound students. Our objectives were for learners to describe demands on empathy, identify their own capacity for bias, appreciate the impact of provider bias on clinical care and demonstrate strategies for managing bias in the ED. Methods: We created an interactive small group session for rotating EM clerkship students, implemented monthly for a total of 55 students. We used self-reflection and partner discussion as primary modes to explore bias, including novel use of a “favorite patient” writing exercise to elicit learner biases in a private and non-confrontational manner. After a brief lecture, partner and group discussion were used to further explore specific bias management strategies and commit to future practice changes.

Outcomes (if available): In follow-up surveys, 87% (35/40) of respondents agreed that the training helped them identify their own biases, recognize when biases are influencing clinical care, manage their biases to provide clinical care, and provide compassionate care to a diverse population. Most qualitative comments noted that reflection, discussion and a non-judgmental environment contributed to these outcomes. Multiple students also reported ongoing awareness and discussion of bias during clerkship clinical encounters.

Summary: Bias is a pervasive problem but one that has also proven difficult to address without meeting resistance or shame from learners. Our experience shows that a brief, non-confrontational and discussion-based curriculum may improve both awareness and management of bias among EM-bound students, while also promoting ongoing engagement and growth.
ABSTRACT

A Novel Tool Facilitates Communication of Pain Quality—“Pain Blocks”

Jason Hack - Brown University, Janette Baird, Gillian Melikian - Rhode Island Hospital

Background and Objectives: Background: Assessment of pain is difficult for many reasons including the inability of patients to translate a subjective experience into words; it is also challenging for health care providers to create a shared understanding of what is being described. Physical representations exist to facilitate the objective scaling of ‘severity’ or ‘intensity’ of pain, but none exist to enable communication of pain quality. This pilot, proof-of-concept study’s objective was to develop, introduce and evaluate consistency of participant interpretation of a novel kinesthetic tool set (Pain Blocks) which was designed to represent qualities of pain.

Methods: Methods: A prospective convenience sampling of participants approached in non-medical settings over 9 months were asked to assess 6 randomly ordered Pain Blocks during structured interviews. They were directed to associate each Pain Block with a pain quality from a list of 12 suggestions or use a free-text area. During the study, Pain Blocks were removed and replaced based upon consistency of response at interval assessments. In part 2, participants were asked if any of the Pain Blocks accurately characterized the quality of their last severe pain.

Results: Results: 220 participants enrolled in the study and assessed the 6 Pain Blocks. They interpreted and applied a pain quality to each of the Blocks. Using interval assessments, a final selection of 6 Pain Blocks was derived that had highly consistent associations with specific pain qualities either individually or with synonyms. Block 1—81.8% (stretching and tearing), Block 3—90.4% (crampy and throbbing), Block 4—99.1% (sharp and stabbing), Block 6—94.1% (crushing and dull), Block 7—95.8% (twisting), Block 8b—100% (burning). There were no differences in consistency of Block interpretation between sexes or for past experience of pain.

Conclusion: Conclusion: We were able to create a group of physical objects (6 Pain Blocks) that were consistently and persistently interpreted, with a high degree of reliability, to represent specific pain qualities across ages and sexes. This proof-of-concept, one-center, paper was limited by the inclusion of English speaking and voluntary participants who were not in pain. Our results support further investigation into tools to create a shared understanding of pain sensations between provider and participant.
ABSTRACT

Buckle Me Up: A Randomized Controlled Pilot of an Intervention for Child Car Safety Education

Danielle Charles-Chauvet - The Warren Alpert Medical School of Brown University, Laura Frackiewicz, Julie Leviter - Yale University School of Medicine, Almaz Dessie - Columbia University Medical Center, Angela Zhang - Warren Alpert Medical School of Brown University, Janette Baird, Susan Duffy - Alpert Medical School Brown University

Background and Objectives: Motor vehicle crashes (MVCs) are the leading cause of preventable death and injury among children in the United States. Although correct car restraints can significantly reduce the risk of injury in MVCs, lack of parental knowledge may leave millions of children improperly restrained. Digital health interventions are revolutionizing patient education in the ED. Computer Intervention Authoring Software (CIAS), a tablet-based platform, allows providers to develop interactive interventions for patients. This study employs CIAS to examine the utility of a novel educational intervention for car safety in the pediatric ED (PED), and its impact on parent knowledge and behavior.

Methods: This randomized controlled trial is comprised of a convenience sample of parents of PED patients ages 0-12 years. All parents were evaluated for baseline car restraint knowledge and behavior. The CIAS group underwent a 20-minute interactive tablet-based program, while the control group received printed handouts on car restraint safety. After one week, both groups received access to online educational materials and a follow-up survey assessing changes in car restraint knowledge and behavior. Logistic regressions were conducted to determine predictors of knowledge retention and behavioral changes.

Results: 295 parents were randomized (143 to intervention, 152 to control); 73.2% completed follow-up assessments. There was no significant difference in baseline car restraint knowledge (75.8% correct in intervention, 65.7% in control, p = 0.12). Compared to the control group, significantly more parents from the intervention group reported modifying their child’s car restraint at follow-up (55.4% vs 48.5%, p = 0.04); modifications included adjusting the harness or putting their child in a booster seat. Logistic regression analysis showed no significant predictors of knowledge retention. 93.7% of the intervention group felt CIAS was helpful or very helpful in learning to improve car safety, and 92.6% reported they were likely or very likely to use the information provided.

Conclusion: CIAS is useful for educating parents in the PED, with the majority of parents reporting positive attitudes towards the intervention. CIAS participants also reported significantly more behavioral modifications at follow-up than controls. Further studies are needed to evaluate the utility of CIAS in other areas of patient education.
ABSTRACT

Clinical Predictors of Acute Diarrheal Disease of Bacterial Etiology in Bangladesh

Monique Gainey, Adam Levine, Stephanie Garbern, Sabiha Nasrin

Background and Objectives: Diarrheal diseases is the 5th leading cause of years of life lost globally accounting for over 1.3 million deaths in 2015. The aim of this study is to investigate the clinical predictors for bacterial etiology in acute diarrheal disease among adults and children over five years of age to allow for more targeted use of antibiotics.

Methods: This study was a secondary analysis of data collected during March – July 2019 from a prospective cohort study of adults and children over five years old presenting with acute gastroenteritis to icddr,b’s Dhaka Hospital in Bangladesh. A wide range of clinical/historical data was collected including a stool sample for culture and PCR testing. Pearson’s chi-square analysis and logistic regression were used to assess the association between clinical predictors and stool testing indicating bacterial etiology.

Results: A total of 713 patients had a completed stool culture/PCR result for inclusion in the secondary analysis with 493 (69.1%) testing positive for a bacterial etiology of diarrhea. Significant clinical predictors of bacterial illness included: weak radial pulse ($X^2=11.81$, $p=0.003$), delayed capillary refill time ($X^2=5.5$, $p=0.019$), rice water stool color observed by study staff ($X^2=9.93$, $p=0.002$) and prior use of antibiotics for the current illness ($X^2=6.48$, $p=0.01$). The odds of having a bacterial etiology of diarrhea decreased with higher systolic (OR=0.99, 95% CI 0.98-0.99) or diastolic blood pressure (OR=0.99, 95% CI 0.98-0.99) and increased with higher heart rate (OR=1.01, 95% CI 1.00-1.02). Mental status ($X^2=3.54$, $p=0.06$) and number of diarrheal episodes (OR=0.97, 95% CI 0.95-1.00) showed an association with bacterial etiology but were marginally statistically insignificant.

Conclusion: Several signs commonly associated with bacterial diarrhea, such as bloody or mucoid stool, abdominal pain, and fever, were not predictive of a positive stool culture/PCR in this study, while other clinical signs, including heart rate, blood pressure, capillary refill time, and stool color, were predictive. Further research to develop predictive tools for clinicians to identify patients with bacterial etiologies of acute diarrheal disease should be conducted in order to allow for timely and appropriate use of antibiotics.
ABSTRACT

Commercially available snakebite device reduces bleeding during repair of laceration at a noncompressible site.

David Lindquist - Brown University, Jonathan Valente - Brown University, Jason Hack - Brown University

Background and Objectives: Some lacerations with active bleeding occur at sites for which the application of tourniquets or compression dressings is not effective. A commercially available snakebite device was pilot tested for novel use as a method of hemostasis and wound repair at a noncompressible site in a live swine model. The device (VenomLOCC) is plastic, with a hook-and-loop strap attachment, is lightweight, is easily carried and washed.

Methods: Each animal acted as its own control. Blood loss was measured and compared between repairs of standardized incisions with and without the device's application. Gauze sponges were used to capture the blood during a 30-second free-bleeding period and during the repair itself. The difference between the dry and wet sponge (gm) for each incision repair method was documented. We calculated the difference in the difference in blood loss of the animal for each incision repair type (Δ1 standard approach - Δ2 new approach). Using a one sample t-test (the expected difference in blood loss between the two incision repair approaches = 0 if the null hypothesis was true) we calculated the mean difference in the deltas and conducted a one sample t-test.

Results: The mean delta difference was 3g with a standard error ± 0.97, the t-test demonstrated that there was a significantly greater loss of blood under the standard repair approach, t(9) = 3.11, p < .01. A statistical power analysis was conducted that showed that with a sample size of 10 animal there was sufficient statistical power to detect this significant effect (β = 0.82, α < .05, one-tailed).

Conclusion: There was statistically significantly less blood loss during the repairs when the device was applied, than when the repairs were performed without the device. This feasibility experiment demonstrates that a lightweight, multi-use, commercially available snakebite device may be useful for hemostasis during laceration repair at anatomic sites not amenable to application of tourniquets or compressive dressings. The device's portability and reusability could have applications in austere medical environments.
ABSTRACT

Comparing the Accuracy of Micro-Focus X-ray to Standard Ultrasound for Locating Glass Foreign Bodies

Shirley Wu - Lifespan/Brown University, Tomas Parkman, Daniel Deciccio, Christoph Rose-Petruck, Shira Dunsiger, Alisa Anderson, Jonathan Fletcher, Erica Lash - Lifespan/Brown University, Will Galvin, Bruce Becker - Brown University

Background and Objectives: Foreign bodies (FB) are found in up to 15% of traumatic wounds seen in Emergency Departments: up to 38% of these are initially missed, increasing patients’ morbidity and physicians’ liability. Point of Care Ultrasound (POCUS) is now considered a reliable imaging choice for detecting FB’s in wounds. Micro Focus X-ray Imaging (MFXI) has a significantly increased resolution as compared to conventional X-ray. This study compared the accuracy of MFXI and POCUS for detecting small glass foreign bodies.

Methods: Small glass fragments were embedded in 60 chicken wings and thighs. Two control samples were prepared with no FB’s to confirm reliability. Five Emergency Medicine physicians with POCUS training, but no additional X-ray training, who regularly employ POCUS as part of their practice, imaged the chicken pieces with a Butterfly iQ (Butterfly; Guilford, CT). They counted and recorded the number of FB’s visualized in each piece. X-ray images were then made with an MFXI, True Focus X-ray tube, model TFX-3110EW. These same physicians, blinded to the chicken pieces, counted the number of FB ‘s in each X-ray image. The counts were entered and analyzed using STATA®.

Results: Across physicians and samples, raters correctly identified 97.6% of the FB’s using MFXI (96.5% interrater reliability) and 62.3% of the FB’s using POCUS (70.8% interrater reliability). Raters were significantly more likely to correctly identify or overestimate the number of FB’s using MFXI as compared to POCUS, for which raters were much more likely to underestimate the number of FB’s (p<.01). The difference in proportion of samples for which FB’s were underestimated for POCUS vs. MFXI was .52 (95% CI: .37-.66).

Conclusion: EM Physicians trained in the use of POCUS, who regularly use this modality in their clinical practice, and who had not received any additional radiology training, were able to identify accurately a significantly greater number of glass FB’s in chicken pieces using MFXI than using POCUS and with much greater interrater reliability.
**ABSTRACT**

**Comparison of EMS Home Visits After ED Discharge vs Observation Unit Admission: Feasibility and Safety**


Background and Objectives: Mobile Integrated Healthcare and Community Paramedicine (MIH/CP) utilizes Emergency Medical Services (EMS) personnel to provide outpatient services in a patient’s home. Programs may decrease utilization of ED and hospital beds by offering timely follow-up care in lieu of admission. In particular, a home-based MIH/CP program may be a viable alternative to observation admissions as these patients are generally lower acuity and anticipated to be discharged within 24hrs. We aimed to show feasibility of ED discharge with next-day MIH/CP intervention compared to admission to an ED Observation Unit (OU).

Methods: We conducted an open-label randomized controlled trial of ED discharge plus MIH/CP follow-up versus admission to the ED-OU among patients with one of three conditions: pyelonephritis, COPD/asthma, and cellulitis. All participants completed baseline assessments (e.g., demographics, burden of illness, level of social support). Patients randomized to the intervention group were discharged with plans for MIH/CP staff to visit within 36 hours. At-home interventions included protocolized reassessment, facilitation of medication and primary care adherence, and home safety evaluation. All subjects had subsequent 7-day phone follow-up and 30-day chart review. We examined percentage of successful home visitation within 36 hours. Secondary outcomes measured were rates of adverse events in 30 days including death, repeat ED visits, and hospital admission. Groups were compared using standard Z test and associations using binary logistic regression.

Results: We enrolled 44 patients with 21 in the intervention group (48% female, mean age 50.3) and 23 controls (52% female, mean age 44.3). Baseline characteristics were similar between groups. 100% of visits were attempted with 71.4% completed, 14.3% declined, and 14.3% not at home. The intervention group had a significantly lower rate of all-cause 30-day adverse events (p=0.047).

Conclusion: At-home MIH/CP intervention after discharge may be a feasible and safe alternative to ED-OU admission. Programs like ours may also represent potential health care cost savings while also improving ED throughput. Further study should be performed through expansion of similar MIH/CP initiatives for a wider range of diagnoses and eligible patients.
ABSTRACT

Dumpster Diving in the Emergency Department: Quantities and Characteristics of ED Waste

Sarah Hsu - Warren Alpert Medical School of Brown University, Jonathan Slutzman - Massachusetts General Hospital / Harvard Medical School, Michael Mello - Brown University

Background and Objectives: Healthcare contributes 10% of US greenhouse gases and generates 4 billion pounds of waste each year. Reducing healthcare waste can reduce the environmental impact of healthcare and lower hospitals’ waste disposal costs. Despite US Emergency Department (ED) representing 140 million visits and approximately 5% of healthcare expenditures, there is no literature surrounding ED waste management. The purpose of this study is to quantify and describe the amount of waste generated by an ED, identify deviations from waste policy, and explore areas for waste reduction in the ED.

Methods: We conducted a 24-hour (weekday) waste audit of all waste (excluding pharmaceutical waste) from the ED of an urban, tertiary-care academic medical center and Level 1 trauma center. All waste generated in the ED during the study period was collected, manually sorted into separate categories based on its predominant material, and weighed. We tracked deviations from hospital waste policy using definitions from the hospital’s Infection Control Manual, state regulations, and HIPAA standards.

Results: The ED generated 671.8 kg total waste during a 24-hour collection period. On a per-patient basis, the ED generated 1.99 kg of total waste per encounter. The majority was plastic (64.6%), with paper-derived products (18.4%) the next largest category. Only 14.9% of the waste thrown in regulated medical waste red bags met the criteria for regulated medical waste. We identified several deviations from waste policy, including loose sharps not placed in sharps containers, re-processable items that should have been diverted from waste, and Protected Health Information thrown in medical and solid waste. We also identified over 200 unused items.

Conclusion: The ED generates significant amounts of waste. Current waste disposal practices in the ED reveal several opportunities for improvement to increase adherence to waste policy, reduce total waste generated, decrease hospital waste disposal cost, and reduce environmental impact. While our results will likely be similar to other urban tertiary EDs that serve as Level 1 trauma centers, future studies are needed to compare results across EDs in other settings, which may have different patient volumes or waste generation rates.
ABSTRACT

Emergency Department Characteristics and Capabilities in Quito, Ecuador

Valerie Chavez-Flores - Brown University, Augusto Maldonado - Universidad San Francisco de Quito, Alexis Kearney - Brown University, Andres Patino - Emory University School of Medicine, Diana Tipan - Hospital IESS Quito Sur, Krislyn Boggs - Massachusetts General Hospital, Carlos Camargo - Massachusetts General Hospital/Harvard Medical School

Background and Objectives: Little has been published about emergency care in Ecuador. This study describes the characteristics, capabilities, resources and capacities of emergency departments (EDs) in Quito, Ecuador, using the National Emergency Department Inventory (NEDI) survey, a survey instrument already used in a dozen countries worldwide.

Methods: The 23-item survey included questions pertaining to ED visit volume and characteristics, physical and administrative structure, clinical capabilities, technological resources, and consult personnel availability. This study included all EDs in Quito that met the following inclusion criteria: must provide emergency care 24 hours/day, 7 days/week, and serve all patients seeking care. The only exception was the inclusion of the city’s pediatric hospital, which only sees children (age <18 years). One representative from each ED (e.g., ED director) was asked to complete the survey based on calendar year 2017. Median, mean, and standard deviations were calculated for continuous variables; percentages were calculated for categorical variables.

Results: Thirty EDs met the inclusion criteria and 26 completed the survey (87% response). The Median number of ED beds was 17 (range 2-61). Median annual visit volume was 22,580 (range 1,680-129,676). One ED only cared for adults and one ED only cared for children; the remaining provided care for both. Cardiac monitors were available in 88% of EDs, CT scanners in 69%, and rooms for respiratory isolation in 31%. Most EDs could manage patients with general medicine (88%), general surgery (88%), and gynecologic (88%) emergencies 24/7. Significantly fewer were able to provide oncologic (46%), psychiatric (46%), and dental (21%) care 24/7. Typical length-of-stay was 1-6 hours in 65% and >6 hours in 31% of EDs. Half of EDs reported operating at full capacity and more than a quarter (27%) reported operating over their capacity.

Conclusion: EDs in Quito varied widely with respect to annual visit volume, ability to treat different pathologies 24/7, and availability of technological resources. Most EDs are functioning at or over capacity and a substantial number have long lengths-of-stay. Further research, along with more investment in emergency care, could help increase the capacity and efficiency of EDs in Ecuador.
ABSTRACT

Evaluating the Use of a Drug Facilitated Sexual Assault Screen in the Emergency Department

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Background and Objectives: Drug Facilitated Sexual Assault (DFSA) testing involves analysis of urine and blood to detect substances that are often involved to facilitate sexual assault (SA) that may not be detected in routine drug screening. In 2016 a designated urine drug screen for DFSA was incorporated into the institutional guidelines as the recommended screen in the evaluation of patients presenting for suspicion of DFSA in a tertiary care academic medical center with an adult and pediatric ED. Other drug testing is recommended only when indicated for medical diagnostic purposes to protect patient confidentiality during legal proceedings. This study seeks to determine if DFSA testing follows clinical guidelines and if other drug testing is being done for reasons other than medical diagnostic purposes.

Methods: A retrospective chart review was performed on patients over 12 years of age evaluated in the ED with the complaint of SA from 1/1/18-12/31/18. 177 charts were reviewed. Descriptive analysis was performed.

Results: The mean age of the patients was 27 years and 90% were female. 32 (18%) suspected DFSA. Of those who suspected DFSA, 29 (90%) reported voluntary substance use prior to the assault and the majority (93%) reported feeling more altered than expected based on their voluntary substance use. Of those who suspected DFSA, 12 of the 32 (37.5%) had the DFSA screen sent. Of the 32 patients who suspected DFSA, 6 had altered mental status (AMS) on ED evaluation. Of the 26 patients with no AMS, 61% had additional drug screens ordered in the ED. The most common drug screens were a urine drugs of abuse (DOA) screen and a serum ethanol level.

Conclusion: In 2018, 18% of the ED visits for SA were suspected to be drug facilitated and only 37.5% of these patients had the DFSA screen sent. Based on these results it is clear that the DFSA screen is not being ordered as recommended. A majority of the patients who suspected DFSA and had no AMS had additional drug screens collected including a urine DOA screen and an ethanol level. It is unclear if these tests were ordered for medical diagnostic purposes or if they were ordered for reasons not compliant with the guidelines. For patients with no AMS, additional drug screens are often not helpful and can be detrimental to patients in legal proceedings. This study has demonstrated a lack of proper utilization of the DFSA guidelines among ED providers and a role for further education of providers on this topic.
ABSTRACT

Faculty Engagement in Resident Simulation: Barriers and Proposed Solutions

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Background and Objectives: Academic faculty divide their time among multiple competing demands—clinical, administration, education, and research responsibilities. Residency programs rely on faculty to meet core educational needs. One such need identified by our group is for an increased number of faculty facilitators for resident simulation sessions. With the goal of increasing faculty engagement in resident simulation-based education, we first sought to identify barriers to faculty participation and then develop strategies to address them.

Methods: Faculty from a single large department of emergency medicine (EM) were emailed to participate in a needs assessment survey exploring factors influencing participation in non-clinical educational activities. Participants were directed to an electronic survey administered using Qualtrics® that included questions about past participation in simulation activities and perceived barriers to facilitating resident simulation sessions. Responses were reviewed and grouped into broad themes. Simulation educators used these responses to develop a faculty support bundle to address identified barriers.

Results: A total of 47 EM faculty completed the needs assessment (41% response rate). Identified barriers were grouped into five categories: 1) Scheduling issues 2) Time requirement for preparation 3) Competing responsibilities 4) Lack of expertise or confidence with simulation-based education 5) Lack of interest. The faculty support bundle addressed barrier 1 with increased scheduling lead time and consistency. Barriers 2 and 3 were addressed by establishing a standard curriculum with facilitator guides and supporting materials. Barrier 4 was minimized by providing simulation expert support, options to co-present, and timely evaluation/feedback data. Barrier 5 was addressed by linking simulation content with the mission of multiple divisions (EMS, US, Toxicology, etc.)

Conclusion: While the barriers identified in our survey may be unique to our academic group, we suspect they may be similar in other departments. The faculty support bundle we developed could be trialed in other programs. Future work will focus on outcomes, specifically measuring rates of faculty participation in simulation after implementation of the support bundle.
ABSTRACT

Fentanyl Beats Methadone a Case Series

Jason Hack - Brown University

Background and Objectives: Methadone is a synthetic, long-acting, Mu receptor agonist used as opioid replacement therapy for heroin for >50 years. Methadone’s attributes to decrease heroin use include limiting craving, withdrawal, and interfering with sought-after positive reinforcement (‘high’) when up-titrated through treatment. We sought to determine community-based understanding of the fentanyl-methadone interaction.

Methods: This was a non-sequential, observational case series presenting to an urban ED for opioid overdose requiring EMS administration of naloxone over two weeks.

Results: Three male and one female patients between 28-52 y/o who reported prior IV opioid use and were currently maintained on methadone (100-180 mg/day) >8 months were included. Medical work ups were normal; drug screens were positive only for methadone and fentanyl. Each reported they had lapsed and intentionally self-administered fentanyl IV for euphoria and stated a version of: “Everyone knows fentanyl cuts through methadone...so I can still get high.”

Conclusion: Methadone’s historically supported salutary effects in patients using illicit opioids may be limited in the current milieu of newly available high potency illicit opioids. Fentanyl is a high potency (100 x morphine) synthetic anesthetic approved by FDA for use in 1972 is currently the most common drug associated with illicit overdose deaths in the US. Recent studies have reported positive fentanyl testing in up to 80% of patients entering opioid replacement therapy, and is also found on surveillance testing during methadone therapy. No clear explanation for the latter results has been proposed or tested in the literature. This case series may provide one explanation. Limitations: Once center, limited participants in a short duration case series. Current opioid replacement therapy with methadone in patients that use, or are directed to use fentanyl by their cohort, may still achieve euphoric reinforcement and therefore are at risk for illicit opioid use and death. This small sample may represent a much larger unrecognized immediate health risk in this population.
ABSTRACT

Focused cardiopulmonary US with mitral annular plane systolic excursion (MAPSE) to diagnose heart failure

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Background and Objectives: Cardiopulmonary US is used frequently to determine if a patient has impaired cardiac function in the ED. Mitral Valve Annular Plane Systolic Excursion (MAPSE) is the measurement of the vertical movement of the mitral valve plane during systole; cardiology literature shows that this correlates with left ventricle ejection fraction (LVEF). Our object is to determine whether measurement of MAPSE alone and when combined with other cardiac and pulmonary ultrasound measurements can help accurately diagnose decompensated heart failure (DHF).

Methods: This was a prospective single center study of consenting adult patients being evaluated for possible DHF between 12/24/18 – 12/30/19. A standard 4 view cardiac ultrasound and 8 view pulmonary ultrasound were performed. The ultrasonographer estimated whether cardiac function was normal or impaired (estimated LVEF less than 50%). MAPSE was measured using M mode on the apical 4 chamber view. MAPSE values of 8mm or lower were considered to be abnormal. E-point septal separation (EPSS) was also calculated; values over 10mm were considered abnormal. Inferior vena cava (IVC) maximum and minimum values were collected and collapsibility index (CI) was calculated. CI less than 20 was considered abnormal. Total B lines were counted, more than 10 was considered abnormal. Chart review was used to determine formal LVEF and diagnosis.

Results: Thirty five patients were enrolled. A total of 9 patients had an abnormal MAPSE result. Eighteen (51.4%) of patients had a final diagnosis of DHF; of those, 11 had a reduced LVEF as calculated by comprehensive echocardiogram (HFrEF). MAPSE alone was 44% sensitive (95% CI 22–69) and 94% specific (95% CI of 69–99) with PPV 89% and NPV 62% for DHF. When using all five metrics (MAPSE, EPSS, estimated LVEF, IVC CI, B lines), patients having 3/5 abnormal results was 68% sensitive (95% CI 43–86) and 69% specific (95% CI 41–87) for DHF and 4/5 abnormal results was 100% sensitive (95% CI 56–100) and 60% specific (95% CI 40–78) for DHF. Having 4/5 abnormal tests is 71% sensitive (95% CI 30–96) and 79% specific (59–91%) for HFrEF exacerbation. Without MAPSE included, having 3/4 abnormal results is 80% sensitive (95% CI 44–96) and 60% specific (95% CI 39–78) for DHF.

Conclusion: MAPSE is a specific test to help diagnose DHF. When combined with measurements of EPSS, LVEF, IVC CI, and B lines, there is increased sensitivity in the diagnosis of decompensated heart failure.
ABSTRACT

Gender Differences in ED Patients Presenting with Sickle Cell Disease-Related Complaints, 2006-2015

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Background and Objectives: Acute pain from vaso-occlusive crisis (VOC) is understood to be a leading reason for ED visits in patients with sickle cell disease (SCD). ED management of patients presenting with an uncomplicated VOC typically involves analgesia (with or without opioids) and IV fluids. Prior studies suggest that female and male patients receive disparate treatment for acute painful conditions. Our primary aim is to determine gender differences in presenting complaints among patients with SCD. Additionally, we aim to determine gender differences in analgesic use in this population.

Methods: This is a cross-sectional study using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), 2006-2015. We identified all ED patients with a primary international disease classification code (ICD-9) diagnosis of SCD. We then determined the chief complaint using the patients’ reported top three reasons for visit to the ED. We evaluated gender differences in presenting complaint and in analgesia medications using descriptive statistics and logistic regression (adjusting for patient and visit characteristics). All analyses accounted for survey design and weighting.

Results: There were 644 visits in NHAMCS, representing an estimated 2,688,349 ED visits with a primary diagnosis of SCD from 2006-2015. Females accounted for 44.4% (95% CI 38.6-50.3) of all visits. Of all visits for SCD, 42.5% (95% CI 36.9-48.3) presented with anemia, 18.3% (95% CI 13.9-23.8) presented with back or extremity pain, and 24.0% (95% CI 18.7-30.1) presented with “other,” complaints. Females had more visits with an “other” complaint, 29.2% (95% CI 21.7-38.0, p=0.07) vs. males 19.8% (95% CI 13.7-27.7). There was no significant difference in the number of opioids given to females compared to males, OR 1.36 (95% CI 0.73-2.54).

Conclusion: In this nationally representative sample of ED visits for SCD VOC, female patients were more likely to have their complaints classified as undifferentiated. However, females did not receive opioid analgesics at different rates during their ED visit; these data did not demonstrate a sex disparity in analgesic prescribing among SCD patients.
ABSTRACT

Gender Differences in Perceptions of Departmental Culture in Academic Emergency Medicine

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Background and Objectives: Departmental culture can greatly impact a woman’s career success in academic medicine. Recognizing factors that contribute to a supportive culture is necessary to establish gender parity. This study aimed to measure differences in experienced culture between men and women in academic emergency medicine (EM).

Methods: This was a cross-sectional study of academic EM faculty. Administrators of all U.S. academic departments of EM (identified via the Academy for Administrators in Academic EM) were asked to distribute the study invitation to their faculty by email. The survey included the Culture Conducive to Women’s Academic Success (CCWAS), a validated instrument for evaluating culture in academic medicine. Domains measured included equal access (19 items), work-life balance (11 items), freedom from biases (5 items), and chair support (12 items). Items were scored with 5-point Likert scales; lower scores indicate more negative experiences. A single burnout question was also included. Multiple imputation was used to estimate missing data. We calculated total and unadjusted mean scores with 95% confidence intervals (CI) by gender, for the overall scale and for each domain. Multiple linear regression was used to compare overall CCWAS and domain scores by gender, adjusted for age, race, geographic region, and level of burnout.

Results: Of 260 respondents from 31 departments, 41% were women. Most participants were 35-44 years old (41%) or 45-54 years old (25%). In terms of race/ethnicity, 77% were white/non-Hispanic, 3% black, 11% Asian, 6% Hispanic, and 3% other. Women had lower mean total score (women: 162.7 (SD 32.9) vs. men: 180.2 (SD 31.6), p=0.001). Average adjusted scores for men were 10.8 points higher than women on the overall CCWAS (95%CI 4.4-17.2), p=0.001. Compared to women, mean adjusted scores for men were 3.6 points (95%CI 0.6-6.6) higher for equal access (p=0.02), 3.3 points higher (95%CI 1.7-4.9) for work-life balance (p<0.0001), 2.1 points higher (95%CI 1.1-3.1) for bias management (p<0.0001), and 1.8 points higher (95% CI -0.2-3.8) for chair support (p=0.07).

Conclusion: In a national sample of academic EM faculty, women reported more negative academic culture scores compared to men. Future efforts should be aimed at exploring how to implement change within EM departments to foster a culture that is equitable and supportive to women.
ABSTRACT

Homelessness and Hospital Closure: Impact on Local Emergency Departments

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Background and Objectives: How do homeless patients use the local emergency department (ED)? Homeless and housed patients differ on a number of metrics (rates of EMS use, chief complaints, admission rates, etc.). The importance of local factors has not been studied. On January 1, 2018 a safety net-hospital closed in Pawtucket, RI. We studied the impact of this closure by analyzing how homeless patients utilized the EDs of the two closest hospitals in the neighboring city of Providence, RI in the year before and after this closure.

Methods: A retrospective chart review compared the ED records of The Miriam Hospital (TMH), (1.8 miles from the closed hospital) and Rhode Island Hospital (RIH, 4.3 miles). ED visits to these hospitals between 1/1/2017 and 12/30/2018 were analyzed. Patients were identified as homeless if their address listed was either “homeless” or a shelter/homeless service provider. All other patients were assumed to be housed. Patients without an address listed (1.5% of the total) were removed from the analysis. The Lifespan IRB approved this study.

Results: A combined 175,863 ED visits were made in 2017, and 180,622 in 2018. Homeless patients accounted for 2.5% of visits in 2017 and 2.9% in 2018. Between 2017 and 2018 homeless visits increased by 17% (4,469–5,241), while the housed visits increased by 2% (171,394–175,381). TMH (the closer hospital) saw a 59% increase in the number of homeless visits; RIH saw a 12% increase. Comparing homeless and housed patients, we found homeless patients were discharged significantly more (74% vs 64%, p <.0001) and had significantly longer door to discharge times; 400.6 minutes (95% CI 392.3–408.8 minutes) for homeless patients versus 273.2 minutes (95% CI 272.6–273.9 minutes) for housed patients. Homeless patients presented with suicidality and chest pain significantly more than housed patients.

Conclusion: When a local ED closes, other EDs are impacted. We found visits made by homeless patients increased more than housed patients, and that this increase was skewed significantly towards the marginally closer hospital. This is important because we also found that homeless patients spend significantly more time in the ED, and complain of chest pain and psychiatric complaints more frequently. This impact of homelessness and hospital closure on local EDs has implications for emergency department management and homeless services both in the ED and in the community.
ABSTRACT

Human Recombinant PRG4 Mitigates Neuroinflammation in a Pre-Clinical Rat Model of Traumatic Brain Injury

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Background and Objectives: The pathophysiology of Traumatic Brain Injury (TBI) is complex and the outcome is largely dependent on the severity of secondary injury, which includes neuroinflammation. Single-mechanism-based neuroprotective drugs in pre-clinical studies have failed to show improvement in patients with TBI. Here we tested a multifunctional recombinant human mucinous glycoprotein ‘lubricin’ (rhPRG4) in a pre-clinical TBI model that may fill the niche in having anti-inflammatory and blood-brain barrier (BBB) protective activity.

Methods: Adult male Long-Evans rats underwent controlled cortical impact (CCI) under anesthesia. Rats were injected intravenously (IV) with rhPRG4 at 1, 2.5 or 5 mg/kg at 1 hr post injury. Control CCI rats received IV vehicle (normal saline). Rats and respective controls (N = 12/group) were euthanized at 6, 24 and 48 hrs post-injury and cortical tissue was collected for Western blot analyses. The cortical levels of CD68 (a biomarker for monocyte invasion) and albumin (whose levels reflect an increase in the permeability of the BBB) were normalized to that of Actin. The levels of CD68 and albumin in the injured cortex of rats treated with rhPRG4 were compared to those found in animals receiving vehicle. The levels of phosphorylation of IKKα/β (p-IKKα/β) and ERK1 (p-ERK1) were also determined and normalized to their total (non-phosphorylated) forms, which are measures of activation of NF-κB signaling pathway.

Results: rhPRG4-injected rats showed a reduction in the accumulation of albumin (Mr~69kDa) in the injured cortex across 2 tested doses (p<0.05 for 1 and 5 mg/kg) at 6 hrs post-TBI, and across all 3 tested doses at 24 hrs post-TBI. Influx of monocytes was reduced at 24 hrs (p<0.05) for all 3 doses but only for the highest dose at 48 hrs. Levels of p-IKKα/β and p-ERK1 were reduced (p<0.05) at 6 hrs post-TBI for 1 and 5 mg/kg; the 2.5 mg/kg dose only reduced (p<0.05) p-ERK1. At 24 hrs both p-IKKα/β and p-ERK1 were reduced (p<0.05) at 5 mg/kg. At 48 hrs only p-ERK1 was reduced (p<0.05) at 1 and 5 mg/kg.

Conclusion: rhPRG4 injected IV 1 hr following experimental TBI reduces the post-traumatic influx of monocytes and is involved in reducing the permeability of the BBB. rhPRG4 also suppressed the phosphorylation of IKKα/β and ERK1, which is consistent with observation that PRG4 blocks innate immunity activation which is responsible for recruitment of inflammatory cells.
Identification of Intracranial Hemorrhage Using an Original Artificial Intelligence System

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Background and Objectives: Intracranial hemorrhage (ICH) is a hallmark of neurologic injury due to stroke or trauma. Treatment requires timely review of ED intracranial imaging. Our team designed a novel artificial intelligence (AI) system, “DICOM Imaging Analytics and Archive” (DIANA), to prospectively analyze ED CT images for ICH. The feasibility and accuracy of DIANA is compared to gold standard, ED radiologist review.

Methods: DIANA was developed by an interdisciplinary team (Diagnostic Imaging, EM and Engineering) at an urban level I trauma center (>165,000 annual patients). DIANA was developed as an open-source, Python command line interface. It was then deployed in parallel to the hospital Picture Archive and Communications System (PACS). In 2019, the team added an AI classifier to DIANA to identify presence or absence of acute ICH on CT, including intraparenchymal, intraventricular, and subarachnoid hemorrhage, as well as subdural and epidural hematomas. The tool was trained and validated on 25,000 public images from the Radiological Society of North America. A 2.5-week pilot study assessed accuracy and latency. DIANA curated all ED head CTs (n=305), 24 hours a day, 7 days a week in blinded fashion, independent from clinical care. AI classified cases as positive or negative for ICH. Due to system reboot, 16 scans were excluded as outliers. Accuracy and time to result were calculated for DIANA and radiologist review (time defined as scan completion to DIANA or radiologist review). Ground truth was defined as final radiologist report extracted by manual, researcher review of the electronic medical record. Latencies were compared by paired t-test.

Results: DIANA identified 100% of ED head CTs completed during the study period. In the 289 studies included in analyses, DIANA demonstrated 91% sensitivity / 94% specificity in detecting presence or absence of ICH. The AUC for DIANA was 97%. Mean latencies to report were 20.47 minutes (SD 11.64), DIANA, and 91.34 minutes (SD 131.22), radiologist. Speed of interpretation for DIANA was significantly greater than radiologists (p = 8.54e-18).

Conclusion: The DIANA system rapidly and automatically retrieves ED CT images. DIANA is able to identify ICH with good sensitivity and specificity. Future work aims to improve system speed / accuracy to optimize neurologic injury screening and expand to other emergent contexts (e.g. CXR, pneumothorax).
ABSTRACT

Impact of Active Versus Passive Preoxygenation on Emergency Department Mortality in Kigali, Rwanda

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Background and Objectives: Background: Hypoxemia during endotracheal intubation (EI) is associated with adverse outcomes such as hemodynamic instability and death. To reduce these adverse events, preoxygenation for EI is recommended in high-income countries (HIC). However, its effect on emergency department (ED) airway management in low- and middle-income countries (LMIC), is not well characterized. This study compared the impacts of active versus passive preoxygenation methods on ED mortality at the University Teaching Hospital-Kigali (UTH-K).

Methods: Methods: A prospective cohort of UTH-K patients requiring ED EI with documented preoxygenation methods were evaluated during January 2017 to December 2017. Active preoxygenation (defined as bag-valve mask or mechanical ventilation) was compared to passive preoxygenation (defined as non-rebreather mask or oxygen facemask). The primary outcome was ED mortality. Duration of preoxygenation, indication for intubation, clinical characteristics, and pre-intubation vital signs were also assessed. Multivariable regression modeling adjusting intubation method, pre-intubation oxygen saturation, and shock index were used to yield adjusted odds ratios (aOR) with 95% confidence intervals (CI).

Results: Results: From 198 patients undergoing EI, 163 met inclusion and were analyzed. Passive oxygenation was used in 76.1% of cases. ED mortality was higher for actively preoxygenated patients (81.4%) compared to passively oxygenated patients (45.8%) (p<0.001). Median age was 35.5 years (IQR 6-84 years) and 72% were male. Trauma patients comprised 52% of cases. Shock index was > 0.9 for 47.6% of patients. The majority of both passively (67.4%) and actively preoxygenated (72%) patients received oxygen for >5 minutes. Passively preoxygenated patients had significantly lower odds of ED mortality compared to actively preoxygenated patients (aOR 0.29, 95% CI: 0.10, 0.93, p=0.04).

Conclusion: Conclusion: In adjusted analyses, passively preoxygenated patients had a lower likelihood of ED mortality. This association could be due to the impacts of active preoxygenation methods or potentially unmeasured confounding factors such as available equipment at time of EI or characteristics inherent to the patient. Further research is needed to better understand the passive preoxygenated approach in LMICs EDs where there exists limited data.
ABSTRACT

Knowledge and Confidence in the Treatment of Emergent Conditions Among Graduating Medical Students Across Colombia

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Background and Objectives: In Colombia, graduating medical students may be selected to complete a compulsory year of social service in the healthcare system. Consequently, many new physicians are responsible for providing emergency care, often without dedicated training in emergency medicine (EM). The World Health Organization (WHO) Basic Emergency Care course (BEC) has been used to train frontline providers in Africa and set to pilot in South America to fill this need. We describe baseline knowledge and confidence in the management of critical illnesses, across medical schools in Colombia prior to BEC implementation.

Methods: A quantitative, cross-sectional electronic survey was developed and administered to graduating medical students at 36 medical schools across Colombia. Demographics and history of previous training information was collected. Knowledge was assessed via 15 multiple-choice questions (MCQs) assessing knowledge taught in the BEC: initial stabilization, trauma, dyspnea, shock and altered mental status. An MCQ score of >75% was defined as passing. Confidence was assessed via 13 questions using 100 mm visual analog scale. Logistic regression was performed to examine associations between previous EM training with confidence and knowledge.

Results: The survey was sent to 2,306 Colombian graduating medical students across Colombia with a response rate of 379 (16.4%). Women comprised 63.5% of the sample; 74.7% were 19-24 years old. The mean knowledge and confidence scores were 69% (95% CI 67.5 – 70.4) and 59.8 mm (95% CI 58.1-61.5), respectively. Knowledge was lowest for initial stabilization and trauma (54.1% and 54.6%) and highest for altered mental status (88%). When compared to those without a previous emergency care course, the odds of passing the knowledge test were 4.0 times greater (95% CI 1.7-9.3) for those completing 1 to 3 previous courses and 8.3 times greater (95% CI 3.6-19.3) for those completing greater than 3 courses. Confidence also increased as the number of courses increased (50.3 mm, 60.1 mm, 63.5 mm, p<0.001).

Conclusion: Knowledge and confidence in the management of emergent conditions was found to be low among senior medical students surveyed in Colombia, but was positively associated with the number of previously completed training courses in emergency care. Results suggest that the WHO BEC course could be a useful training intervention to standardize medical education in Colombia.
ABSTRACT

Let’s Get Personal: Professional Credential Displays and Gender.

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Background and Objectives:Differential standards in academic medicine based on gender for self-promoting behavior have been described. This study explores differences in office display of professional and personal items between male and female academic physicians.

Methods:Faculty at a university hospital were invited to participate in a study on office set up. Participants were blinded to the study aim. Investigators evaluated offices of consenting participants to assess the number of professional and personal displays. De-identified data on gender, age, academic rank, medical specialty, and physical office characteristics were also recorded. To control for the overall propensity to display in-office items, a personal-professional display score (PPDS) was calculated, equal to the number of personal items minus professional items. Correlations with the number of professional and personal items displayed were analyzed by univariable Poisson regression. Correlations with the PPDS were analyzed via univariate linear regression. Multivariable regression models were performed with inclusions and exclusion thresholds of p=0.05 and p=0.1, respectively.

Results:A total of 48 physicians participated with 23 (47.9%) from Emergency Medicine, nine (18.8%) from Surgery and sixteen (33.3%) from Internal Medicine The median number of professional items displayed was 5.0 for women (IQR 3.0, 9.0 ) and 6.0 items (IQR 2.0, 12.0) for men. When controlling for specialty and rank, there was no statistical difference in the rates of professional display by men compared to women (IRR=0.9, 95% CI 0.7-1.2). The median number of personal displays was 14.5 items for women (IQR 8.0, 25.0) and 6.0 items (IQR 3.0, 15.0) for men resulting in a statistically different rate (IRR=0.7, 95% CI 0.6-0.9) when controlling for specialty, generation, rank and office characteristics. When controlling for specialty and office characteristics, there was no difference in the PPDS between genders.

Conclusion:In the studied population, display of professional items was not found to differ between genders. However, men displayed fewer personal items than women. Similar gender differences have been found in other industries. In addition, a higher personal item display has been linked to increased wellness. Future directions may compare physician wellness scores with their number of personal displays.
ABSTRACT

Past, Present and Future of Emergency Medicine in Ecuador

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Background and Objectives: Emergency Medicine (EM) was recognized as a specialty in Ecuador in 1993. Currently, there are two 4-year EM residency programs and an estimated 500 residency-trained emergency physicians country-wide. This study describes the current state of EM in Ecuador.

Methods: Twenty-five semi-structured interviews were conducted with residency-trained EM physicians, general practitioners, public health specialists, prehospital-care personnel, and physicians from other specialties. Interview topics included the development of EM as a specialty, the provision of emergency care, and the current state of EM training programs, with an emphasis on challenges and opportunities for improvement.

Results: EM has gained recognition in Quito, where the only two EM residency programs are located, but its expansion to the rest of Ecuador has been slow. Few residency-trained EM physicians practice in other cities. Outside of Quito, most emergency care is provided by general practitioners or non-EM specialists. EM physicians cite the lack of medical supplies and emergency department overcrowding as common challenges. Few EM physicians work in private hospitals or take on leadership roles within their emergency departments due to financial disincentives. Similarly, there is almost no involvement of EM physicians in the leadership of emergency medical services, and in some cities there is no hospital prenotification system to alert providers of impending arrivals. Finally, even though the Ecuadorian Society of EM and Disasters has existed for more than 30 years, it has few members.

Conclusion: Emergency Medicine has reached important milestones in the last 3 decades in Ecuador. Challenges remain, most important of which is a need for stronger leadership within the specialty. More involvement of EM physicians in administrative and leadership roles, standardization and expansion of training programs, and stronger advocacy on both a local and national level can help strengthen the specialty and improve emergency care.
ABSTRACT

Peripheral Vasopressor Use and Extravasation Risk in Rwanda: A Prospective Cohort Study

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Background and Objectives: Vasopressor medications are critical in the management of hemodynamically unstable patients. In high-income settings, administration of vasopressors through a central venous catheter (CVC) is the preferred standard. However, due to lack of availability and high complication rates, CVCs are not widely used in low- and middle-income countries (LMICs).

Methods: This prospective, observational cohort study evaluated the use of peripheral vasopressors and incidence of extravasation events during peripheral vasopressor use, in patients with hemodynamic instability at the University Teaching Hospital-Kigali (UTH-K). Patients >18 years receiving peripheral vasopressors in the Emergency Department (ED) or Intensive Care Unit (ICU) for >1 hour were eligible for inclusion. The primary outcome was extravasation events. Data were collected on demographics, shock etiology, vasopressor type, dosing and duration, intravenous (IV) gauge, and IV location. Patients were followed until extravasation, medication discontinuation, death, or CVC placement. Data were analyzed descriptively, and incidence of extravasation was calculated with 95% confidence intervals (CI).

Results: Data from 64 patients were analyzed, with 52% enrolled in the ED and 48% in the ICU. The median age was 49 years (Interquartile Range [IQR]: 33-65) and 55% were female. Distributive shock was the most frequently etiology (47%). IV location was antecubital fossa/upper arm in 31% of cases and forearm/hand in 43%. IV gauges < 18 were used in 58% of locations. The majority of patients were treated with adrenaline (66%) followed by noradrenaline (41%) and 11% received multiple vasopressors. The median duration of treatment was 19 hours (IQR: 8.5-37) with a maximum of 451 hours. Discontinuation of treatment was due to mortality (36%), resolution of instability (34%), and CVC placement (9%). The extravasation incidence was 0.8 events per 1000 patient-hours (95% CI: 0.2-2.2). There were two extravasation events (3.3%), both limited to soft tissue swelling.

Conclusion: The observed incidence of extravasation with peripheral vasopressors was low, even with long durations of use, suggesting peripheral infusions may be an acceptable approach when barriers exist to CVC placement. Further research in larger populations to validate and study the safety of peripheral vasopressors in LMICs is needed.
ABSTRACT

Promotion of Academic Emergency Medicine Faculty: Contributors to Disparities and Potential Solutions

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Background and Objectives: Fewer women and underrepresented minorities in medicine (URiM) reach senior ranks of academic emergency medicine (AEM). In order to understand disparities in advancement of EM faculty, we investigated the mechanics of promotion, its benefits, and the structure of mentorship in AEM departments.

Methods: We conducted semi-structured qualitative interviews of AEM faculty leaders in a nationally representative sample of EDs. Interviews focused on 3 domains (mechanics and motivation for promotion, mentorship structure). Responses were recorded in real-time into a standardized electronic data collection form. Themes around barriers to promotion and potential solutions within the domains were identified.

Results: Across 28 departments, we included 7 chairs, 15 vice-chairs, and 6 faculty who led the promotion process. Departments varied around requirements, processes, and transparency for promotion. Some programs reported that institutional promotion metrics do not align well with the scholarly work of EM faculty, especially those on clinical or combined tracks. Despite this, few departments (n=4) provide official or unofficial metrics for advancement specific to EM. Promotion benefits also varied; most departments (n=22) reported increasing financial compensation (though often nominal), while few reported other tangible benefits (e.g. sabbatical, title). Mentorship structures were often informal and lacked a clear process regarding communication of promotion criteria. Most departments did not report tracking or measuring success of mentorship programs. Finally, a minority of departments (n=7) had specific programs or strategies for women or URiM faculty; for women, these were largely focused on stopping the promotion clock. Key solutions identified were: early and structured mentorship (n=25) with accountability, and clarity on promotion metrics (n=20) especially for EM faculty on clinical, teaching or combination tracks.

Conclusion: There was significant variability in both mechanics and benefits of promotion to EM faculty, and formal mentorship programs to help faculty advance were inconsistent. The lack of robust processes may lead to more pronounced disparities for women and URiM. Best practices should include increased transparency and clarity of promotion requirements for AEM, and structured mentorship to address these gaps.
ABSTRACT

Smart-phone Based Real-Time Estimation of Anemia

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Background and Objectives: Anemia (AN) is a prevalent concern with morbidity and mortality effecting low income communities disproportionately. Diagnosis requires analysis of blood. Early recognition of AN may influence triage decisions and outcomes. There is a need for a non-invasive, rapid, bedside test to detect AN. We describe a smartphone (SP) based method using palpebral conjunctiva (PC) image analysis to predict hemoglobin (hb) concentration.

Methods: Images of the PC from both eyes were obtained using an IPhone 8 in patients presenting to the emergency department for any reason who had complete blood count (CBC). Patients with disease or injury to the eye were excluded. 26 image variables, such as hue, color, entropy were extracted from PIXELs selected using a custom crystallization algorithm from a representative point on the on the PC using MATLAB (Mathworks Inc., Natick MA). Step-wise linear regression was used to determine best correlation of image variables from the right eye to CBC derived hb (HBC) in the derivation arm, constructing a prediction formula. Images from the left eye were used in a validation arm to test the prediction. Receiver-Operator characteristics using WHO AN threshold and Bland-Altman plots were applied. Models were analyzed using PROC GLIMMIX. Family-wise error rate was set at 0.05 using the Holm adjustment for multiple comparisons. Statistical analyses were performed using SAS version 9.4 (The SAS Institute; Cary, NC).

Results: 146 adult patients (52% male, mean age 50, 19-93 years) were enrolled with 3000 images. Patients had a normally distributed and wide range of hb values (4.7-19.6 g/dl). There was a high degree of association between algorithm predicted hb (HBA) and HBC slope=0.97 (CI=0.89-1.05), p<0.001. HBA had a sensitivity of 91% (CI 87-94%), specificity of 73% (67-80%) and accuracy of 83% (79-86%).

Conclusion: Images from an SP camera can be used to estimate hb. HBA is highly correlated to HBC and has sufficient sensitivity as a screening tool. The next steps involve creating a SP application to contain analysis on the device, describe inter-rater reliability and precision analysis.
ABSTRACT

Stay and Play Cardiopulmonary Resuscitation Protocol Associated With Decreased Prehospital Time-to-Epinephrine

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Background and Objectives: Background: In 2017, Rhode Island (RI) statewide prehospital protocols began mandating a minimum of 30 minutes of on-scene CPR for patients with atraumatic out-of-hospital cardiac arrest (OHCA) to optimize CPR quality. We sought to identify the impact of this protocol on method and timing of prehospital vascular access.

Methods: Methods: We performed a multicenter, retrospective cohort study of adult patients with witnessed, atraumatic OHCA six months pre- (April to September 2016) and post-implementation (March to August 2017) of a 30-minute CPR protocol. Data were obtained from ED and prehospital records. Outcomes were defined as method of initial attempted vascular access (Tibial Intraosseous – TIO, Humeral Intraosseous – HIO, and Peripheral IV – pIV), first pass success, and when documented, time-to-epinephrine. Outcomes were compared by Fisher’s exact test or Welch’s t-test.

Results: Results: We identified 95 patients transported by 17 EMS agencies to three EDs in RI with complete records. We excluded patients with pre-existing access (n=5) and return of spontaneous circulation before cannulation (n=2), thus including 88 patients for analysis. We did not observe significant association between initial attempted vascular access and use of the 30-minute protocol in pre- vs post- groups (15/38 vs 17/50 TIO, 2/38 vs 7/50 HIO and 21/38 vs 26/50 pIV). Initial attempted TIO was significantly associated with first pass success compared with pIV placement (OR = 6.88, 95%CI 1.4-67.2, p = 0.01). We did not detect a difference in time-to-epinephrine between methods of initial attempted vascular access, regardless of first pass success (all post-hoc power < 35%). However, we found a significant difference in time-to-epinephrine between pre- and post- groups with first pass success (n1=19 n2=37, 8.88 vs 6.09 min, p = 0.025, Cohen’s d = 0.72) and between pre- and post- groups regardless of success (n1=16 n2=32, 9.16 vs 6.35 min, p = 0.01, Cohen’s d = 0.85).

Conclusion: Conclusion: In a moderate-sized sample of patients with witnessed OHCA in RI, the implementation of a statewide 30-minute CPR protocol was associated with a substantial decrease in time-to-epinephrine despite no evidence of change in methods of initial attempted vascular access. By limiting pressure for rapid transport, the implementation of stay and play CPR protocols may have unintended effects on prehospital OHCA management and patient outcomes.
ABSTRACT

Training for Emergency Care Providers in the Prehospital Setting in Rwanda

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Background and Objectives: Prehospital care is a critical component of emergency care worldwide, including in countries such as Rwanda. Studies have noted that basic affordable training positively affects EMS systems. The study aims to assess the retention of emergency care knowledge after a focused training intervention.

Methods: A nonrandomized prospective interrupted time-series approach was utilized for a training intervention focused on knowledge of key process indicators including: patient assessment, airway intervention for respiratory distress, intravenous fluids in hypotension, and glucose for hypoglycemia. Thirty direct patient care providers were identified through the prehospital medical command office and included as participants. Data was collected on age, gender, training, and emergency care knowledge. A pretest and tailored eighteen-hour educational intervention were administered after which an immediate posttest and 11-month post tests were analyzed.

Results: There were 30 prehospital providers studied, of which 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 duration of patient care was 10 years (IQR: 7,11). One post training assessment was conducted immediately and another 11 months after the education intervention. There were 24 participants (80%) that were trained and completed an immediate posttest and 16 (53.3%) completed both the immediate and 11 month posttests. The mean pretest score was 59.7% (95% CI: 42.2, 77.20). The immediate posttest mean score was 87.8% (95%CI:74.7, 100) and 78% (95%CI: 59.2, 96.8) 11 months after training. There was a 56% (95%CI: 36.2, 75.8) relative increase in mean knowledge score. All respondents reported that the training had increased their medical knowledge and improved patient care.

Conclusion: The study demonstrates that a tailored educational intervention on pre-hospital process indicators can have a positive impact on provider knowledge. However a yearly sustainable training program may be appropriate to maintain a knowledge base. Further studies are needed to demonstrate the impact of training on patient care and outcomes.
ABSTRACT

Training for Failure: An Analysis of Prehospital Airway Management During Witnessed Cardiac Arrest in Adults

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Background and Objectives: Background: In Rhode Island (RI), advanced life support is administered by two distinct levels of EMS providers, Paramedics and “Cardiacs.” Each receives at least 1,200 and 300 hours of training, respectively, but both are credentialed to perform endotracheal intubation (ETI) or place supraglottic airways (SGA) in out-of-hospital cardiac arrest (OHCA). As a result of this variable training, we evaluated the impact of provider level on airway management before and after implementation of an extended duration on-scene CPR protocol.

Methods: Methods: We performed a multicenter, retrospective cohort study of adult patients with witnessed, atraumatic OHCA six months pre-(April to September 2016) and post-implementation (March to August 2017) of a 30-minute CPR protocol. We obtained data from ED and prehospital records. We compared initial attempted, highest attempted, and final methods of airway management as well as overall success for ETI between pre- and post- groups and among provider levels using Fisher’s exact test.

Results: Results: We identified and included 95 patients with OHCA transported by 17 EMS agencies to three EDs. 9/41 (22.0%) and 12/54 (22.2%) patients in the pre- and post- groups were treated by at least one Paramedic; the rest were treated only by Cardiacs. We did not identify significant differences in methods of initial airway management between or within Cardiacs and Paramedics overall and within the pre- and post-implementation periods. Overall, we found significant differences between Cardiacs and Paramedics in highest level of airway attempted [2/74 vs 0/21 passive oxygenation (POX), 18/74 vs 0/21 bag-valve mask (BVM), 9/74 vs 5/21 primary SGA, 45/74 vs 16/21 ETI, p=0.025] and final airway on ED arrival [2/74 vs 0/21 POX, 34/74 vs 2/21 BVM, 8/74 vs 4/21 primary SGA, 2/74 vs 5/21 rescue SGA, 27/74 vs 9/21 ETI, 1/74 vs 1/21 unrecognized esophageal intubation, p=0.0019]. However, we did not identify a significant difference in overall success rate for ETI among Cardiacs vs Paramedics (27/45 vs 9/16).

Conclusion: Conclusion: In a moderate-sized sample of witnessed OHCA in RI, there were significant differences in highest attempted and final methods of airway management between different level EMS providers despite similar overall success rates for ETI. These findings were largely explained by increased BVM use vs rescue SGA placement following unsuccessful ETI among Cardiacs.
Use of Mitral Valve Annular Plane Systolic Excursion (MAPSE) to estimate LV systolic function

Alexandra Schick, Nehal Al-Sadhan, Josh Kaine, Kristin Dwyer

Background and Objectives: Ultrasound is used frequently to help determine if a patient impaired cardiac function in the ED. Mitral Valve Annular Plane Systolic Excursion (MAPSE) is the measurement of the vertical movement of the mitral valve plane during systole; cardiology literature shows that this correlates with ejection fraction. Our object is to determine whether measurement of MAPSE by an EM physician during a focused bedside US can be used to accurately estimate LV systolic function.

Methods: This was a prospective single center study of consenting adult patients being evaluated for possible decompensated heart failure between 12/24/18 – 12/30/19. A standard four view cardiac ultrasound was performed. The ultrasonographer estimated whether cardiac function was normal or impaired (estimated left ventricular ejection fraction [LVEF] is less than 50%). MAPSE was measured on the apical 4 chamber; M mode was used to measure MAPSE. MAPSE values of 8mm or lower were considered to be abnormal. These results were compared to the results of a comprehensive echocardiogram performed within 12 months of study enrollment. Standard descriptive statistics were used.

Results: Thirty five patients were enrolled. A total of 9 (26%) patients had an abnormal MAPSE. Fifteen (42%) patients appeared to have a depressed LVEF based on the focused ultrasound. On comprehensive US, ten patients had a measured LVEF less than 55%. Median MAPSE by LVEF: LVEF <30% was 7 with (range 7-9, IQR 1), with LVEF 30-54% was 10.5 (range 6-16, IQR 4), and with LVEF more than 54% was 12.5 (range 7-20, IQR 6). MAPSE has a sensitivity of 100% (95% CI 63-100%) and specificity of 77% (95% CI 56-90%) for detecting patients with estimated LVEF less than 50%; PPV was 60% and NPV 100%. When compared to those who had a confirmed LVEF <55% on comprehensive echocardiogram, MAPSE has a sensitivity of 78% (95% CI 40-96%) and specificity of 73% (95% CI 52-87%).

Conclusion: MAPSE does correlate with ED provider estimated LVEF on focused cardiac ultrasound. It also does correlate with LVEF as calculated on comprehensive echocardiogram. Further studies are needed to validate these results on a larger scale.
ABSTRACT

Emergency Medicine Practice: Trends and Motivations Among Emergency Physicians

Nathalia Dolan, Victoria Martin

Background and Objectives: The number of emergency physicians graduating residency is on the rise but emergency rooms continue to experience staffing challenges. We hypothesize that emergency physicians are trending toward reduced work hours. This study aims to delineate practice trends and to understand whether these are related to gender.

Methods: A 20-question online survey was designed to examine practice trends and motivations among attending emergency medicine physicians. It was distributed through a combination of email and social media outreach. 310 subjects were enrolled. Data was obtained on subject demographics, practice type, practice trends, and factors driving those trends. Data was analyzed using descriptive statistics.

Results: Between March and June 2019 310 subjects participated in our study. Inclusion criteria comprised graduation from an emergency medicine residency. There were no exclusion criteria. Subjects were evenly split by gender and predominantly comprised of North-Easterners ages 30 to 59 working full-time either in an academic or community setting. Univariate analysis demonstrated work practice differences related to gender: decreasing hours in 39% of female compared to 30% of male subjects, and increasing hours in 26% of female compared to 32% of male subjects. Multivariate analysis using a proportional odds model suggested that men trend toward increasing hours compared to women, but this finding was not statistically significant. Among subjects who reported increasing hours, the most common driver was changing role at work (62%) followed by financial and patient needs. Among subjects who reported decreasing hours, the most common driver was work-life balance (83%) followed by childcare needs and burnout.

Conclusion: This pilot study suggests that women may trend toward decreasing hours compared with men. This study was underpowered to reach statistical significance but suggests that this area is ripe for further study.
ABSTRACT

Go Outside to Be a Better Doctor Inside: An Innovative Wilderness Based Physician Leadership Curriculum

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Background and Objectives: Leadership training can be an effective tool that improves clinical outcomes when employed in emergency settings. It is often assumed that a physician automatically develops leadership skills as he or she becomes a more senior clinician, however, this is not always the case. The goal of this research is to develop an effective leadership curriculum that incorporates wilderness based simulation training to prepare physicians to lead in any high stress environment.

Methods: A literature search was conducted to research the current state of physician leadership training and to review the evidence of improved outcomes due to effective leadership in emergency medicine and trauma settings. The literature review served as the foundation for the development of a wilderness based leadership training course. A six-step curriculum development model was used for the design: problem identification and general needs assessment, targeted needs assessment, goals and objectives, educational strategies, implementation and evaluation and feedback.

Results: The major conclusion from the literature review indicated that having a leader present directing the team rather than performing the technical skills resulted in better outcomes. However, examples of curricula to develop these skills are not well described. Our wilderness based leadership training course begins with two leadership lectures covering leadership principles, skills and vignettes for group discussion. Each student then leads a team in a simulated scenario and is evaluated on their use of the wilderness leadership procedures and six leadership principles: planning, decision making, executing, communicating, command and control and assessing. Finally, a high fidelity simulation in the wilderness setting serves to move the learner out of their comfort zone and into a mental state that recreates a high stress emergency medicine or trauma scenario.

Conclusion: Skillful team leadership has been shown to improve medical outcomes, however becoming a strong physician leader does not happen automatically. Through a wilderness based leadership training curriculum, we aim to create the ideal dose of “stress inoculation” in a controlled learning environment. As learners develop the skills to turn a high stress crisis in the wilderness into a well-run medical rescue, they can in turn develop better team leadership skills for their in-hospital patient care.
ABSTRACT

A Multi-State Analysis of New England Patriots Football Games on ED Patient Volume

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Background and Objectives: Government holidays, major sporting events, and various public occasions are thought to cause fluctuations in ED patient volume. The National Football League (NFL), an American professional sport with millions of followers, has an annual season from September to February. In this study we evaluate the effect of games played by a regional NFL team, the New England Patriots, on ED volume in three tertiary referral centers across New England.

Methods: This study is a multicenter retrospective chart review of three different academic tertiary care referral centers in New England. We collected ED arrival per hour data from Beth Israel Deaconess Medical Center (BIDMC) from July 2011 to June 2019, Dartmouth Hitchcock Medical Center (DHMC) from July 2011 to October 2019, and Maine Medical Center (MMC) from July 2012 to June 2019. Paired t-tests were used to compare daily volumes on Sundays that Patriots games were played versus Sundays within the NFL season that the Patriots did not play. Separate t-tests were conducted to analyze daily volume on days that the Patriots played in the NFL Super Bowl. Additional t-test analyses of daily volumes on Mondays related to Patriots games were conducted. We excluded Mondays during which Patriots games were played and we did not analyze the effects of Thursday and Saturday games.

Results: In aggregate we found a statistically significant (p=.041) reduction in patient volume on Sundays that the Patriots played versus Sundays they did not play during the NFL season. The largest difference in patient volume was observed at MMC with an average of 3.14 more patients on non-game Sundays. We did not observe a statistically significant increase in patient volume on Mondays after Patriot games. We also did not observe a statistically significant difference in patient volume on Super Bowl Sundays during which the Patriots competed.

Conclusion: While EPs might subjectively perceive a difference in patient volume during major sporting events, this data presents mixed evidence regarding whether ED volume at tertiary referral centers is influenced by external factors.
ABSTRACT

An Adaptation of the Lung Ultrasound BLUE-protocol in Emergency Department Patients Presenting with Dyspnea

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Background and Objectives: Dyspnea is a common emergency department (ED) complaint associated with significant morbidity and mortality, requiring prompt evaluation and treatment. Lung ultrasound (LUS) has shown growing utility in diagnosing pulmonary pathology. In a 2015 article, Lichtenstein designed an ICU algorithm called the Bedside Lung Ultrasound in Emergency (BLUE)-protocol using well-studied LUS profiles, with the goal of differentiating the cause of respiratory distress using ultrasound. For the individual diagnoses considered, including pulmonary embolism (PE), chronic obstructive pulmonary disease exacerbation (COPD), congestive heart failure exacerbation (CHF), pneumothorax (PTX), and pneumonia, LUS has sensitivities and specificities between 90 and 100% with the BLUE-protocol reporting an overall accuracy of >90%. We hypothesize that an ED adaptation, the ED-BLUE-protocol, should have similar utility in the undifferentiated ED patient presenting with dyspnea.

Methods: This was a prospective observational study of a convenience sample of patients presenting to one of two enrolling EDs. Included patients were those presenting for evaluation of dyspnea or similar complaint. Emergency physicians (EP) documented their initial impression, then performed the ED-BLUE and documented their results. Initial impression and ED-BLUE results were then compared to the final diagnosis based on chart review. Qualitative statistics were used to analyze the data.

Results: During the current study period 45 patients were enrolled. The ED-BLUE resulted in the correct diagnosis in 39 patients (86.7%). Initial impression was documented in 39 patients, and was correct in 30 (76.9%). Fourteen patients had multiple final diagnoses. One patient had a diagnosis not included in the algorithm differential. Of the 45 patients, 38 had a final diagnosis COPD and/or CHF; ED-BLUE was correct in 35 of these cases (92.1%).

Conclusion: Our ED-BLUE algorithm is a helpful tool in the evaluation of patients with undifferentiated dyspnea. Our algorithm is particularly accurate for patients with CHF or COPD, the most common causes of acute respiratory distress in the ED. ED-BLUE was better than provider initial impression. In the original BLUE study, patients with multiple diagnoses were excluded; further research is needed to better assess how to evaluate these patients.
ABSTRACT

Analysis of Demand/Capacity Mismatch in an Academic Emergency Department Using a Staircase Model

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Background and Objectives: Matching provider capacity to expected daily arrivals will optimize flow. This is often done by graphing new ED arrivals and adjusting shift times to provide enough capacity to account for the volume. Most models assume a constant rate of patients-per-hour (PPH) for providers. Studies have demonstrated that PPH is not static but decreases in a stepwise manner throughout the shift. We analyzed the change in demand/capacity mismatch between the traditional model, a staircase model, and a staggered staircase model.

Methods: Retrospective study at an academic ED with 55,000 annual visits. Daily resident staffing includes 5 PGY2 shifts, 4 PGY1 shifts, and 4 off-service resident 8 hour shifts. We assigned each resident type a standard number of patients seen: 14 for EM2s, 10 for EM1s, and 8 for off-service residents. EM3s serve in a supervisory role. We collected data from July 2017 to June 2019 and graphed this by hour of arrival. We graphed provider capacity using static PPH, as well as a staircase model where each resident type saw a higher PPH earlier in the shift, decreasing in a stepwise manner throughout the shift.

Results: Our ED averages 150.7 arrivals per day. Based on our model, residents would see 142 patients per day, leaving a gap of 8.7 patients to be made up for by the EM3 or attending. Using static PPH, the demand/capacity curve demonstrated a gap of 18.7. When the more accurate staircase model was used, the gap increased to 27.7 with a significant amount of wasted capacity with the arrival of new teams, and a significant build-up prior to the arrival of the overnight team. When maintaining the staircase model and staggering the shifts, this curve was smoothed out and the patient gap was decreased to 14.2, a theoretical benefit of 48.6%. We calculated the absolute difference in patient arrivals and resident capacity at each hour of the day, demonstrating when there is either a gap in coverage or excess capacity. Using a two-sample t-test we compared the means of these 24 points and found a significant difference (p<0.001) between the models, suggesting the staggered model reduces the amount of capacity mismatch.

Conclusion: Academic emergency departments should use the staircase model to analyze provider capacity. EDs would benefit from visualizing their capacity curves in order to identify mismatches and staggering resident shifts in order to improve flow.
ABSTRACT

Characteristics of Emergency Department Patients Being Evaluated for Opioid Use Disorder

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Background and Objectives: Opioid Use Disorder (OUD) remains an epidemic in the United States. Understanding the circumstances that contribute to developing OUD can aid in primary prevention. In a previous study surveying Emergency Department (ED) patients with OUD, 59% of subjects reported their first opioid exposure was from a legitimate medical prescription. Our ED developed a clinical pathway for patients presenting with an opioid overdose or seeking treatment for OUD. The goal of this study was to describe characteristics of initial opioid use in patients enrolled in the pathway.

Methods: This was a prospective observational study that surveyed a convenience sample of ED patients at an urban tertiary care teaching hospital presenting with opioid overdose, seeking management of OUD, or with clinical concern for OUD. Subjects were identified via electronic screening of triage notes and secondary screening for OUD by a research assistant (RA). While in the ED, subjects completed a survey instrument administered by an RA. Primary measures included type, source, and circumstances around initial opioid use. The survey also inquired about current opioid use. Frequencies were calculated.

Results: Nineteen subjects were enrolled over four months; 79% (14/19) were male. The mean age of initial opioid use was 23 years. Over one-third (37%, 7/19) first tried an opioid when they were under 18 years old. Nearly half (47%, 9/19) reported their first opioid exposure was from a prescription medication whereas 42% (8/19) reported first using heroin. Oxycodone (7/9) was the most common initial prescription opioid. One-quarter (26%, 5/19) reported their first use was from a legitimate prescription in their name. 37% (7/19) received their first opioid from a friend or family member. Over one-third (37%, 7/19) realized the potential to misuse opioids after 2-3 days of use; of that cohort, most (5/7) realized after just one dose.

Conclusion: We identified characteristics of initial opioid use in ED patients being evaluated for OUD. Many patients with OUD were exposed to opioids while young. The majority reported obtaining the opioid from a prescription, family member, or friend. Oxycodone was the most common initial prescription opioid. For a third of patients, a remarkably short course (1-3 days) led to realization of the potential for misuse.
ABSTRACT

Comparing Resource Utilization and Disposition Decisions Among Emergency Physicians

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Background and Objectives: Variability exists between emergency physician (EP) utilization of resources and decision to admit patients. EP’s decision to admit as well as tests and consults ordered have substantial cost and throughput implications. Several factors explain differences in admission rates including risk aversion and contrasting practice styles. In this study we validate and expand upon prior findings by Hodgson et al (2018) that showed a positive correlation between EP resource utilization and admission rate.

Methods: This is a retrospective study using data from our tertiary referral center with 55,000 visits annually from July 1, 2016 to June 30, 2019. Average consults placed, admission/discharge rate, lab, plain-film, and CT/MRI orders per patient were calculated for each EP. We excluded patients that left without being seen and EPs with less than two-hundred patient encounters. We created scatter plots and conducted linear regression analysis to examine relationships between patient disposition and resource utilization variables.

Results: 162,798 ED visits were analyzed among 70 different EPs. Data showed variability in EP admission rate (mean=.39, SD .031), discharge rate (mean=.56, SD .031), consultations (mean=.58, SD .054), lab order per patient (mean=3.57, SD .27), plain film per patient (mean=.64, SD .051), and MRI/CT per patient (mean=.74, SD .092). When comparing averages for individual EPs we found statistically significant relationships between admission and advanced imaging orders ($r^2 = .34$, p<.001), admission and plain film orders ($r^2 = .24$, p<.001), admission and lab orders ($r^2 = .46$, p<.001), and admission and consultation orders ($r^2 = .37$, p<.001).

Conclusion: Differences exist in EP resource utilization rates as measured by number of tests ordered and consultation rates per patient. EPs with higher resource utilization rates tend to admit more patients, while those with less resource utilization admit fewer patients. Understanding this variability in practice patterns can help guide optimal clinical decision making and cost-effectiveness of care delivery among a group of EPs.
Continuous Neuromuscular Blockade following Successful Resuscitation from Cardiac Arrest: A Randomized Trial

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Background and Objectives: Neuromuscular blocking (NMB) agents are often administered to control shivering during targeted temperature management (TTM) following cardiac arrest. In this study we hypothesized that early, continuous NMB would result in a greater reduction in serum lactate levels amongst comatose post-cardiac arrest patients.

Methods: We performed a multicenter, randomized trial of continuous NMB vs. usual care following cardiac arrest at 5 urban tertiary care centers in the U.S. between 12/2014 and 5/2019. Adult patients who achieved return of spontaneous circulation, remained unresponsive, and underwent TTM after cardiac arrest were included. Subjects were randomized to receive open-label continuous NMB with rocuronium for 24-hours vs. usual care. Categorical variables are summarized by frequencies and percentages. Continuous variables were compared with t-tests or Mann-Whitney tests depending on the distribution of the data. The group difference in lactate at 24-hours was assessed using a linear mixed effects model. Fixed effects included the allocated treatment (NMB vs. usual care), shock stratification, time point (0-hour, 12-hour, and 24-hour), and the interaction between treatment and time point.

Results: A total of 83 patients were enrolled and 80 were analyzed in the modified intention to treat cohort (37 and 43 in the NMB and usual care arms, respectively). The median lactate at randomization was 4.2 mmol/L (IQR 2.5-5.4 mmol/L). There was no between group difference in the change in lactate over time (p=0.1 for the interaction between study arm and time). There was also no between group difference in lactate at 24-hours after enrollment (median 2.0 [IQR 1.5, 3.1] vs. 1.7 [1.3, 2.3] in the NMB and usual care arms respectively; ratio of geometric mean difference in lactate at 24-hours of 1.2 [95%CI 0.9, 1.6], p=0.2). There was no difference in hospital survival (38\% (NMB) vs. 33\% (usual care), p=0.6) or survival with good neurologic outcome as defined by a modified Rankin scale of 0-3 (30\% [NMB] vs. 21\% [usual care], p=0.4). There were no adverse events in either arm.

Conclusion: Continuous NMB compared to usual care did not reduce lactate over the first 24-hours after enrollment as compared to usual care. There was no difference in overall hospital survival, hospital survival with good neurologic outcome, or adverse events.
ABSTRACT

Correlation of Attending and Patient Assessment of Resident Communication Skills in the Emergency Department

Jason Lewis - Beth Israel Deaconess Medical Center, Lakshman Balaji, Anne Grossestreuer, Carlo Rosen, Nicole Dubosh - Beth Israel Deaconess Medical Center/Harvard Medical School

Background and Objectives: Communication and interpersonal skills are one of the ACGME’s six core competencies. Valid methods for assessing these are lacking. Various communication assessment tools have been developed, including those from faculty and patient perspectives. How these different assessors compare is unknown. The goal of this study was to determine the degree of agreement between attending and patient assessment of resident communication skills. We hypothesized that the two measures would have substantial agreement.

Methods: This was a retrospective analysis of a prospectively collected dataset of EM residents at an academic medical center. From July 2017 – June 2018, residents were assessed on communication skills during their emergency department shifts by both patients and EM faculty. Patients completed the Communication Assessment Tool (CAT), a validated 15-item questionnaire based on a 1-5 Likert scale with 14 physician-specific questions. Faculty rated residents’ communication skills with patients, colleagues, and nursing/ancillary staff using a 1-5 Likert scale. We calculated mean CAT score and mean faculty ratings for each resident. Means were divided into tertiles due to nonparametric distribution of scores. Agreement between CAT and attending ratings of residents were measured using Cohen’s Kappa for each attending evaluation question. Scores were weighted to assign adjacent tertiles partial agreement.

Results: During the study period, 952 CAT questionnaires and 1097 faculty evaluations were completed for 26 residents. CAT scores and attending evaluation of patient communication (k 0.21), communication with colleagues (k 0.21) and communication with nursing/ancillary staff (k 0.26) showed fair agreement.

Conclusion: There is fair agreement of patient and faculty ratings of EM residents’ communication skills. The use of different types of raters may be beneficial in assessing trainees’ communication skills.
ABSTRACT

Emergency Department Bedside Spectral Doppler Assessment of Acute Arterial Insufficiency

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Background and Objectives: Acute limb ischemia (ALI) is a common presentation in the emergency department and represents an acute limb threatening emergency. Current accepted methods of screening for ALI include physical exam with palpation of distal pulses and use of a handheld doppler (HHD). Both methods have poor interobserver reliability and use of HH doppler for ALI is not well validated. Spectral doppler (SD) is well validated for acute ischemia by radiologists. Emergency physicians (EPs) are skilled at performing vascular ultrasound for aortic aneurism and deep vein thrombosis. The objective of this study is to compare the accuracy of EP performed SD for ALI versus HHD.

Methods: This was a prospective observational study of a convenience sample of patients presenting to the emergency department for evaluation of ALI. Patients receiving a vascular surgery consult and either computed tomography angiography (CTA) or peripheral angiography were included. EPs blinded to angiography results performed HHD assessment of the affected limb then SD assessment of the same arteries within 30 minutes. EPs rated their findings as normal, abnormal, or absent for each then rated their confidence level with their findings as high, moderate, and low. Bedside findings were then compared to angiographic findings. Sensitivity, specificity, positive and negative predictive value (PPV, NPV), and kappa of HHD versus SD were calculated.

Results: Over the study period, 60 assessments were performed on 30 patients. First- and second-year residents did 66.7% of the tests. Mean age was 68.4 ±14.7 years. Mean BMI was 28.7 ±6.7. On CTA, 86.7% of patients had severe stenosis or occlusion. Sensitivity and specificity of HHD vs CTA is 98.1% and 37.5%. PPV is 91.1%. NPV is 75%. Kappa is 0.45 (p=0.001). Sensitivity and specificity of SD vs CTA is 84.6% and 37.5%. PPV is 89.8%. NPV is 27.3%. Kappa is 0.19 (p=0.13). EP confidence was high for HHD and SD in 68.3% of cases. In 41 cases were confidence was high for both HHD and SD, kappa was 0.54 (p<0.001).

Conclusion: SD performed as well as HHD when evaluating for ALI with slightly higher specificity. There was moderate agreement in the HHD vs CTA. EP confidence in both was similar. When EP confidence was high, HHD and SD had good agreement. These results are limited by the small number of patients enrolled. Based on this preliminary data, this study will be repowered to better assess for differences in each technique.
ABSTRACT

Emergency Department Conditions Affects the Rate of Patients that “Left Without Being Seen”

David Chiu - Beth Israel Deaconess Medical Center, Mohammad Alghamdi - Beth Israel Deaconess Medical Center, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: Patients who left without being seen (LWBS) from the emergency department (ED) receive suboptimal care. Frequent reasons for patients who LWBS include long wait times to be seen by providers. The objective of this study is to evaluate the rate of LWBS and how it varies by ED conditions such as number of boarders, patients in the waiting room and total patients registered.

Methods: A retrospective chart review of all patients that presented to an academic, urban tertiary care hospital with an annual ED volume of ~55,000 patients. The study period was from 07/01/2017 through 06/30/2019. Data elements collected included patient’s disposition, age, gender, Emergency Severity Index (ESI), and ED volumes including: number of arrivals, number of boarding patients, number of patients in WR, and number of total patients in ED. LWBS with 95% confidence intervals are reported here as the primary outcome measure. Chi squared test was performed to compare observed and expected LWBS during conditions of crowding defined as Waiting Room (WR) ≥ 20, boarders ≥ 10, Total Registered Patients (TRP) ≥ 80.

Results: A total of 224,325 patients were included in the study. The overall LWBS rate was: 1.6%. The LWBS rate when WR ≥ 20 is 2.7%, compared to 0.9% at other times. Also the LWBS rate when TRP ≥ 80 is 2.1% while it is 0.7% when TRP < 80. The LWBS rate when more than 10 boarders is 1.6% compared to the rate when less than 10 boarders is 1.6%. Chi squared test performed revealed a statistically significant difference between patients that LWBS during days when WR ≥ 20 (p < 0.001) as well as days where TRP ≥ 80 (p < 0.001). There was no statistically significant difference between LWBS on days when boarders ≥ 10 (p = 0.85).

Conclusion: LWBS rate varies based on waiting room volume and total registered patients in the ED. LWBS is not associated with boarding volume. There are times when boarding volume can be high, however WR and TRP are low, and therefore patients are not more likely to LWBS. Implementing strategies to reduce WR volume and TRP, can significantly reduce the LWBS rate.
ABSTRACT

Emergency Department Quality Assurance Nurses Facilitate Follow-up of Laboratory and Imaging Abnormalities

Maxwell Blodgett, Kiersten Gurley, Ryan Burke - Beth Israel Deaconess Medical Center, Shamai Grossman

Background and Objectives: Abnormalities in laboratory studies and imaging studies are often uncovered as part of an ED patient’s workup. While they frequently inform a patient’s clinical course when identified in real time, often times abnormalities in laboratory and imaging studies are incidental to a patient’s care and are at times either missed or not addressed. The objective of this study was to evaluate an ED-based quality assurance (QA) nursing program in which a trained nurse reviews laboratory and imaging studies to ensure appropriate follow-up for abnormal results.

Methods: The QA nurse reviewed all abnormal laboratory values and all updates to radiology imaging daily for the preceding day. Pre-set parameters were used to determine the necessary follow-up for laboratory abnormalities. When lab values were outside of set parameters, when a radiology over-read resulted in a clinically actionable change (as recommended by the reading radiologist), or at the discretion of the QA nurse, an on-call physician was contacted to determine the appropriate intervention.

Results: 14 months of data were reviewed comprising a total of 1,351,212 laboratory studies and approximately 95,000 imaging studies, for a total of 63,518 ED visits. 6534 patient or PCP contacts were undertaken over the study period. 2659 of these were from laboratory tests and 4004 were from imaging studies. The most common action taken was contacting a patient’s primary care physician (5783 cases). An MD was consulted 741 times and a medication was prescribed 613 times. Medications were prescribed most commonly on the basis of culture data (432 cases) and imaging findings (122 cases). 21 cases resulted in a patient being called back to the ED. Eight of these instances were due to an imaging study and 13 were due to laboratory study abnormalities.

Conclusion: Although abnormalities in laboratory and imaging studies are often incidental to a patient’s care, a dedicated ED quality assurance nurse program resulted in the identification and communication of numerous laboratory and imaging abnormalities and frequently resulted in changes to patients’ subsequent clinical course.
ABSTRACT

Epidemiology of Post-9/11 Terrorism in the United States

Stephen Ngo - Beth Israel Deaconess Medical Center, Ritu Sarin - Beth Israel Deaconess Medical Center, Alexander Hart - Beth Israel Deaconess Medical Center

Background and Objectives: Background: The September 11, 2001 terrorist attacks have demonstrated the catastrophic potential and ubiquitous reach of terrorism. The location, method of attack and resulting casualties are unpredictable, but as providers of acute care, emergency physicians play a crucial role in mitigating the consequences of terrorist attacks. This retrospective study using the Global Terrorism Database aims to provide insight on the epidemiology of terrorist attacks in the United States in the Post-9/11 period which will be important to help guide important hospital policy decisions to better mitigate and treat the consequences.

Methods: Methods: This is a retrospective study using data from the Global Terrorism Database from 9/12/2001-9/12/2017. The definition of terrorism was defined by using Criteria I and Criteria II of the Global Terrorism Database. A total of 389 terrorist incidents were reported in the United States during this time. The primary endpoints were the number of fatalities, injuries and total casualties. Other variables collected included weapon type, ideology, group targeted, location of attack, and regional clustering, among others. Descriptive analysis was performed.

Results: Results: There were a total of 389 events. There were 115 events (29.56%) that resulted in at least one casualty. There were a total of 227 fatalities, 696 injuries and 923 casualties. The average number of fatalities was 0.58 people per event. The average number of injuries was 1.79 people per event. The average number of casualties was 2.37 people per event. Attacks utilizing firearms had the greatest number of fatalities per event at 2.14 (n = 81). This was followed by attacks utilizing multiple weapon types, at 1.93 fatalities (n= 14). Vehicular attacks had the greatest number of injured per event at 6.57 (n = 7), followed by attacks using chemical exposures at 5.00 (n=2). The most commonly targeted group were Private Citizens and Property, which were solely targeted in 78 events (20.05%), resulting in 419 (45.50%) casualties.

Conclusion: Conclusions: Terrorist attacks occurred in every region of the United States using variable methodologies, resulting in significant morbidity and mortality. Emergency physicians should be ready to respond to casualties resulting from a variety of weapon types, with special attention to injuries resulting from firearms, blunt trauma and chemical exposures.
Factors Affecting Acuity and Volume of Emergency Medicine Clerkship Caseload

Josh Joseph - Beth Israel Deaconess Medical Center / Harvard Medical School, Nicole Dubosh - Beth Israel Deaconess Medical Center/Harvard Medical School, Edward Ullman - Beth Israel Deaconess Medical Center, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: Ensuring that students have the opportunity to learn from a variety of case presentations is an essential challenge of the EM clerkship. However, it is unclear if the attention required to care for high-acuity patients limits the students’ overall volume of cases. We hypothesized that students who saw more high-acuity patients would see fewer patients overall during their clerkship.

Methods: This was a retrospective study of patients seen by students during the EM clerkship at an urban tertiary care center, in which students assign themselves to patients ad libitum. Student-primaried patients were reviewed by algorithms that identified cases with high-risk chief complaints (e.g. chest pain, active GI bleeding), hospital admission, and ICU admission. These were used as covariates in a generalized estimation equation model to predict the acuity and overall number of patients a student saw during the clerkship.

Results: From 2012-2019, 317 students completed the clerkship, seeing an average of 48 (SD 11.5) patients during their 11-12 shifts at the tertiary care ED. Students saw an average of 7 (SD 3.2) patients with high-risk chief complaints. The median Emergency Severity Index of patients across all students was 3. Each ICU patient seen was associated with one fewer patient seen during the rotation as a whole (95% CI -1.9 - -0.1). Conversely, seeing patients with higher-acuity complaints and patients requiring admission were associated with increases of 0.40 (95% CI 0.05 - 0.75) and 1.4 (95% CI 1.2 - 1.6) in the overall number of patients seen, respectively.

Conclusion: Our data suggests that seeing patients with higher-acuity presentations does not significantly impact students’ overall patient volume during an EM clerkship. Instead, students who actively seek out higher-acuity patients may be more likely to see more patients overall during the rotation. Medical educators may take acuity exposure into consideration while creating student schedules.
ABSTRACT

Grit, Stress, and Anxiety in Emergency Physicians

Matthew Wong, Maxwell Blodgett, Josh Joseph - Beth Israel Deaconess Medical Center / Harvard Medical School, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: Grit is a personality trait that relates to perseverance and the ability to maintain long term goals. Recent interest in burnout, resilience, and wellness also has fueled an interest in grit, but it is unclear if grit is a stable trait in emergency physicians, or how it relates to stress or anxiety.

Methods: At an academic tertiary-care medical center we enrolled a cohort of residents and attending emergency physicians and studied them for three consecutive years. We administered the Duckworth Grit Scale and the State Trait Anxiety Inventory (STAI) annually, and we administered the Perceived Stress Scale (PSS) quarterly to subjects, to measure their grit, anxiety, and stress, respectively. Descriptive statistics and generalized estimating equations accounting for repeated measures were performed. We compared grit measurements from year-to-year, and regressed grit scores to PSS scores and STAI scores to discern a relationship.

Results: Fifty-six participants were followed for on average 5.12 quarters (IQR: 2 – 7), totaling 439 subject-quarters of data of a possible 1068 subject-quarters of total department staff (42.5% response rate). At the time of initial enrollment there were 26 PGY-1s (46.4%), 7 PGY-2s (7%), PGY-3s (6%), and 17 attendings (30.6%) for subjects. The average age of the study participant at time of enrollment was 31.2 years (SD: 5.8). One hundred and eight grit scores were calculated, and the average grit score of subjects was 3.70 (95%CI 3.6 – 3.8). The difference between a subject’s first-year and second-year grit score was not significantly different (p=0.376), nor was the difference between the first-year and third-year measured grit score (p=0.928). Three hundred and fifty eight PSS scores were calculated (mean 11.97, 95%CI 11.37 – 12.6), and 106 STAI Trait scores were calculated (mean 34.5, 95%CI 32.8 – 36.1). Individuals with a higher grit score had lower PSS scores (beta -3.26, 95%CI -5.6 to -0.9), and lower STAI scores (beta -5.41, 95%CI -9.4 to -1.5).

Conclusion: In this group of emergency medicine residents and attendings, grit is a stable personality trait and it does not significantly change from year to year. Individuals with higher grits scores also report less stress, and also have less anxiety. These results implicate grit as an important personality trait for emergency physicians to have and to cultivate.
ABSTRACT

Hourly Capacity of a Single CT Scanner and Timing Difference for Single versus Multiple Scans

Bryan Stenson - Beth Israel Deaconess Medical Center, Peter Antkowiak - Beth Israel Deaconess Medical Center, Josh Joseph - Beth Israel Deaconess Medical Center, David Chiu - Beth Israel Deaconess Medical Center, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: CT scans are frequently ordered in all EDs. Many patient dispositions depend on these results, and scanner throughput is integral to overall department flow. The majority of EDs function with a single scanner. We sought to determine the maximum hourly capacity of a single scanner in an ED, as well as the difference in timing for single versus multiple scans on a patient.

Methods: Observational study done at an academic ED with 55,000 annual visits. There is a single CT scanner present in the ED performing almost all the scans. Encounters were observed, making note of multiple time points and collecting intervals of time in room, time on table and scan time. Qualitative comments were documented such as ambulatory status, use of lift, and intubation status. This was a convenience sample based on availability of the data collector to observe for 1 to 4 hours. A Wilcoxon rank sum was performed to test for a difference between time per scan based on if one or multiple were ordered.

Results: 76 patient scans were observed over 31 hours. Data was collected at an actual rate of 2.45 scans per hour (SD 1.26). The majority (47; 61.8%) of encounters were single CT scans but the remainder involved multiple body parts scanned on a single patient. The median time spent in the CT room was 11.47 minutes. The interquartile range (IQR) was 9.5 to 18.1 minutes. Median time the room spent empty after each scan was 3.72 minutes (IQR 0.95-12.6). Median total time per patient scanned was 15.20, or 3.95 scans per hour. Patients with a single scan had a median time of 10.93 minutes, and those with multiple scans took 6.52 minutes per scan. This was statistically significant (p<0.001).

Conclusion: In the ED, a single CT scanner can process a maximum of 4 scans per hour. However, due to the range of times a scan can take, along with other processes such as lab results and transport, this number may be even lower. Ordering more than that rate will lead to bottlenecks and prolonged delays. Additionally, multiple scans performed on the same patient take less time per scan, as there is significant time spent moving the patient, completing paperwork and setting up the room; this gets diluted when multiple scans are performed. Further analysis is needed to determine the true contributions of all additional factors such as total number of scans ordered, total patient volume, and downstream effects of strokes and traumas.
ABSTRACT

Hurricane Mortality: Knowledge Gaps and Implications for Research

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Background and Objectives: Recent disasters have illuminated the challenges with ascertaining hurricane-related deaths, including those from indirect causes such as interruption of medical care, damage to infrastructure, infectious disease, displacement, and impoverishment. This study analyzes publication patterns on hurricane-related mortality.

Methods: A structured search of published literature was performed using the terms “mortality” and “death” with “hurricane”, “typhoon”, “cyclone”, and “tropical storm.” All searches were performed in the PubMed/MEDLINE database. Articles with an English-language abstract, human mortality as an outcome or theme, and a topical focus including hurricane(s) were included. Eligible abstracts were categorized by publication type, availability and type of data, number of hurricane events studied, and geographic focus.

Results: 308 publications were identified; 127 met inclusion criteria. Of these, 56.7% were published in 2010 or later; 81.9% examined a single hurricane. Hurricanes Katrina (16.9%), Maria (13.6%), Sandy (11.9%), and Andrew (5.9%) accounted for 48.3% of publications examining specific hurricanes. The US accounted for 71.4% of publications; Bangladesh was second (7.1%). In the US, Puerto Rico (19.0%) and Louisiana (19.0%) were the most studied. 49.3% of publications reported data for 30 days or fewer following hurricane impact; 89.6% reported six months or less. 33.8% reported excess or all-cause mortality. Climate change was referenced in five articles (3.9%).

Conclusion: Published literature on mortality predominantly examines the short-term impact of individual hurricanes, mostly from the US. Asian nations are under-represented despite more frequent cyclones, larger populations at risk, and historically higher death tolls. Climate change is expected to accelerate this toll. There is thus an urgent need to expand our understanding of immediate and long-term mortality among populations that will be the worst affected.
Mortality and Fluid Resuscitation in Pneumonia: A Retrospective Observational Study

Patrick Tyler - Beth Israel Deaconess Medical Center, Douglass Hansell, Jennifer Sahatjian, Walter Linde-Zwirble, Wesley Self - Vanderbilt University, Nathan Shapiro, Peter Hou - Brigham and Women’s Hospital

Background and Objectives: Multiple studies have suggested that large fluid balance is associated with higher mortality in sepsis. However, many of these are underpowered with uncontrolled confounders. We hypothesized that receiving more or less fluids than expected given a subject’s healthstate (fluid propensity) would result in higher in-hospital mortality after controlling for variation in mortality risk in ICU patients with pneumonia.

Methods: We identified patients 18+ years, from the 2013 Premier Database, presenting with pneumonia, entering medical ICU from the ED, with a chest x-ray and antibiotics on day of admission that received at least 1L of day one fluids (DOF). Risk of hospital mortality was examined through a binary response model using present on admission and day one hospital information (including demographics, acute organ dysfunctions and comorbidities). A DOF propensity ANOVA model was also constructed using similar day one and patient comorbidity information. The relationship between DOF and hospital mortality was examined directly (using 1 L intervals from 1-1.99L, 2-2.99L, up to 9+L) and propensity adjusted deltaDOF (actual - expected) using categories 1L wide spanning from -2.5L to +4.5L. Actual and expected mortality within each category was used to identify potential fluid risks.

Results: 43,438 patients were selected with an average age of 66.7 and 55% male. The severity model performed well with an R-sq=97.6, AROC=0.76. The DOF model had an r-sq=22.4% and a 5-95% range of 2.0-5.5L. Overall, those receiving DOF>7.99L had statistically significant higher than expected mortality (36 vs 30% for 8L and 42 vs 32% for 9L, p<0.05 for each). Similarly, deltaDOF groups had higher than expected mortality beyond +2.49L (increases of 4%, 4% and 6.5% above expected for +3, +4 and +5 groups). Subgroup analysis showed that non-shock patients had no excess mortality. For those with shock, after adjusting for severity and propensity to give fluids, mortality increased by 3.3% (1.3% - 5.1%, p<0.05) for each liter above expected.

Conclusion: In this large retrospective propensity- and risk-adjusted analysis, patients who received >8L fluid in total, and those with shock who received > 2.5L fluid than predicted by the propensity model, experienced higher than predicted mortality. Prospective studies are needed to define the appropriate volume and timing of fluid resuscitation in sepsis.
ABSTRACT

Nurse-InteRN Mentorship Program

Amanda Doodlesack - Beth Israel Deaconess Medical Center, Lorian Jenkins, Nicole Dubosh - Beth Israel Deaconess Medical Center/Harvard Medical School, Leslie Bilello - Beth Israel Deaconess Medical Center

Background and Objectives: Teamwork and communication are crucial for optimal patient care in the emergency department (ED). The responsibilities of residency can be challenging for new interns, especially when learning to work with all members of the care team. Nursing colleagues can serve as guides for interns when navigating their new environment and in turn, nurses can learn new knowledge and skills from residents. A novel nurse-intern mentorship program could improve the transition to residency for interns and improve patient care by promoting a collaborative interprofessional environment built on teamwork and camaraderie. The goals of the program are to develop supportive relationships between nursing-intern pairs, improve interns’ communication and teamwork abilities, promote sharing of knowledge and skills, and make the ED more collaborative and supportive for all.

Methods: This is a year-long program required of all emergency medicine (EM) interns at our institution and open to interested nurses. During intern orientation, all 13 interns and nurse mentors were notified of their mentor/mentee assignment and given contact information. Over the course of the year, each intern-nurse pair is required to meet at least once per month for 15-30 minutes. Guidelines for these meetings suggest discussion topics specific to patient care, performance feedback, as well as wellness check-ins and relationship building. In addition, all nurse-intern pairs are expected to attend quarterly large group social gatherings. At the end of the year, a survey will be administered to all participants to gauge participation, satisfaction, and effectiveness of the program.

Results: To date, 13 EM intern-nurse pairs have enrolled in the program. Initial feedback from intern-nurse pairs, nursing leadership, and residency leadership has been positive. A survey will be administered at the end of the year.

Conclusion: This program is in its first year and is ongoing. We hope the program will promote a culture of mentorship, professional development, teamwork and ultimately improve collaboration between nurses and physicians to provide better patient care. Ultimately if effective, we hope it may be implemented at other EM residency programs as well.
ABSTRACT

Point of Care Echocardiography Regional Wall-Motion Abnormalities in Acute Coronary Syndromes—A Case Series

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Background and Objectives: Previous studies have shown that acute coronary syndromes (ACS) cause cardiac regional wall-motion abnormalities (RWMA) that can be visualized on echocardiography. However, there has been little research assessing the utility of emergency physician (EP)-performed point-of-care cardiac echocardiography (POCE) for the detection of RWMA in ACS. We hypothesized that EP-performed POCE may accurately identify RWMA, and that these RWMA would be associated with coronary lesions.

Methods: Retrospective observational case series of patients presenting over a 26 month period to two emergency departments (ED) with a high pretest probability for ACS and documented EP diagnosis of RWMA on POCE. All POCE were performed by ultrasound fellowship-trained EPs. Following institutional review board approval, data was abstracted from patient charts, including POCE, labs, electrocardiograms (ECG), cardiology-performed echocardiograms, and cardiac catheterizations. All selected ED POCE cases were reviewed by blinded trained EPs for agreement of diagnosis. Qualitative statistics were used to analyze the data.

Results: Twenty seven patients were enrolled. All 27 subjects (100%) received serum troponin T testing, 21 (78%) received comprehensive echocardiography, and 16 (59%) received cardiac catheterizations. Serum troponin was above the institutional minimum detectable threshold in 20 subjects (74%). Comprehensive echocardiography confirmed the presence of RWMA in all 21 patients (100%) evaluated. Of the 16 patients who received cardiac catheterizations, 14 (82%) identified coronary lesions compatible with ischemia and POCE RWMA. Of the remaining two patients, one was diagnosed with myocarditis and the other with Takotsubo cardiomyopathy. Six patients (29%) were diagnosed with ST segment elevation myocardial infarctions (STEMI) during their index visit in the ED. Of these six patients, all had POCE RWMA corresponding to the area of ischemia noted on ECG.

Conclusion: POCE-identified RWMA were helpful in the early identification of coronary lesions in this case series. POCE may be a useful adjunct in identifying a subset of high-risk chest pain patients in the ED who could benefit from expedited care, particularly those who do not meet established criteria for STEMI activation. Limitations of this study include those intrinsic to retrospective case series.
ABSTRACT

Resident Sex and Patient Self-assignment

Isha Agarwal - Beth Israel Deaconess Medical Center, Evan Leventhal - Beth Israel Deaconess Medical Center, Josh Joseph - Beth Israel Deaconess Medical Center, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: Current evidence, though limited, suggests residents avoid picking up patients with more complex chief complaints, and those requiring an invasive medical exam or procedure. In one study, the length of time between patient rooming and resident self-assignment for the chief complaint of vaginal bleeding was found to be double the median of all other emergency room chief complaints (12 minutes vs. 6 minutes, Patterson et al, Academic EM. 23; 6, 2016). We hypothesized that resident sex would also impact patient self-assignment; specifically, that male residents would be less likely than females to assign themselves to patients with a chief complaint of vaginal bleeding.

Methods: We performed a retrospective cross-sectional study at a tertiary academic emergency department using data from all 13,797 adult patients presenting between 2010-2019 with one of four chief complaints (vaginal bleeding, rectal bleeding, epistaxis, laceration). Patient sex was not easily ascertainable prior to resident self-assignment. We conducted a chi-squared analysis to compare the ratio of male to female residents for each chief complaint, adjusting for patient age, race, primary language, ESI score, patient bed location, shift time, day of week, calendar month, and resident specialty.

Results: The door-to-resident time was significantly longer for vaginal bleeding (52 minutes) or rectal bleeding (49 minutes) compared to epistaxis or laceration (37 minutes) (Wilcoxon Rank Sum p < 0.001). Using the ratio of male to female residents for epistaxis/laceration (combined) as a reference group, the adjusted odds ratio of being treated by a male resident for a patient with vaginal bleeding was 0.70 (95% CI 0.63-0.77, p < 0.001), and was 0.91 (95% CI 0.83-0.98, p < 0.02) for a patient with rectal bleeding.

Conclusion: In a single facility, male residents were less likely to assign themselves to patients with vaginal bleeding compared to patients with chief complaints of similar severity and complexity. This may be due to male residents’ discomfort with performing pelvic exams, or their hesitance to coordinate a chaperone for the procedure. In secondary analysis, male residents were also less likely to assign themselves to patients with a chief complaint of rectal bleeding. Further work is necessary to determine the reasons for avoidance of patients with vaginal and rectal bleeding, and to improve the quality of care for these patients.
ABSTRACT

SOFA score performance based on infection site.

Rahul Pawar, Jenny Shih, Lakshman Balaji, Anne Grossestreuer, Parth Patel, Michael Donnino, Ari Moskowitz

Background and Objectives: In this study, we investigated whether sequential organ failure assessment (SOFA) score performance differs based on site of infection amongst patients admitted to the intensive care unit (ICU) with infection.

Methods: This was a single center retrospective study of adult ICU patients admitted with infection between 2008 and 2018. Patients were uniquely classified into different infectious sites based on ICD9/10 codes. Infectious sites included were pneumonia, meningitis, isolated bacteremia, cellulitis, cholangitis/cholecystitis, intestinal and diarrheal disease, endocarditis, urinary tract infection and peritonitis. SOFA score performance was compared across infectious sites.

Results: A total of 12,283 patients were included. Of these, 50.6% were female and the median age was 70 (IQR 57-82). The most common infectious sites were pneumonia (32.2%) and UTI (31.0%). Overall, 1703 (13.9%) patients died prior to hospital discharge. The mean SOFA score for the cohort was 5.4 (95%CI: 5.3-5.4). Patients with peritonitis had the highest mean SOFA score (6.7, 95%CI: 6.3-7.0) and patients with cellulitis had the lowest mean SOFA score (4.7, 95%CI: 4.5-5.0). SOFA score discrimination was highest among patients with endocarditis [area under the curve (AUC) 0.79, 95%CI: 0.69-0.90] and lowest for patients with isolated bacteremia (AUC 0.59, 95%CI: 0.49-0.70). Within each quartile of SOFA score, mortality was highest in patients with pneumonia and peritonitis and lowest in patients with cellulitis. The addition of infectious site to SOFA for the prediction of in-hospital mortality improved model discrimination (AUC 0.69, 95%CI: 0.68-0.70 vs. 0.71, 95%CI: 0.70-0.73, p<0.01).

Conclusion: Site of infection is an important consideration when interpreting the SOFA score. This is an important finding as SOFA emerges as an important tool in the definition and prognostication of sepsis.
Substance Use Disorder Related Social Work Referral among Emergency Department Patients


Background and Objectives: Emergency Departments (EDs) have a unique role in identifying patients at risk and linking them with substance use disorder (SUD) resources. This observational study aimed to assess the number and demographics of patients presenting to the Beth Israel Deaconess Medical Center (BIDMC) ED who received social work consults for substance use treatment.

Methods: Data was gathered from electronic medical records of 3,480 patients presenting to the ED between April 2017 through August 2019. A Kaplan Meier plot was used to assess the time (number of visits) to referral for social work with the hypothesis that minority patients are less likely to receive social work consultation and/or find placement. Patients who presented with substance use/overdose as well as those in which substance use was not the primary problem were included in the study.

Results: Of all patients, 2,304 (66%) were male. The median age was 34 (IQR 23-51) years. Median ED length of stay (LOS) was 447 (IQR 290-753) minutes. Sixty-five percent of patients were White, 17% Black, 6% Hispanic, 4% Asian, 6% Other, and 2% unknown race. The median number of visits was 1; 2901 (83%) had one visit, and the range was 1-133 visits. English was the preferred language in 95% of patients. 505 (15%) of the 3406 patients who reported a race/ethnicity received a referral during their first visit. The first-visit referral rate did not significantly differ among white vs non-white patients. 332 (15%) of white patients and 173 (15%) of non-white received a referral (p: 0.673). However, the Kaplan Meier curve showed a significant difference (p<0.001) between white patients and non-white patients in number of visits to referral for patients with multiple ED visits.

Conclusion: Although there were no differences in referrals by race at the first visit for SUD, this study shows that it takes more visits for non-white patients to get a referral compared to white patients if they have multiple ED visits for SUD. With SUD continuing to contribute considerably to morbidity and mortality, health care providers, especially those in the ED, could potentially make a difference by connecting patients with necessary services in a timely manner.
ABSTRACT

Systematic Review of Contrast Enhanced Ultrasound in Pediatric Abdominal Traumatic Injuries

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Background and Objectives: Trauma continues to be one of the leading causes of death in the pediatric population. Computed tomography (CT) has long been the gold standard at diagnosing abdominal traumatic injuries. CT exposes patients to radiation and experts have questioned our over utilization of this risk exposing technique with more than half of CTs performed being negative for traumatic injuries. Contrast enhanced ultrasound (CEUS) may offer an alternative, radiation sparing, evaluation additionally allowing for multiple repeat exams throughout a patient’s clinical course. CEUS recently gained FDA approval in the US to evaluate traumatic injuries. The objective of this systematic review is to evaluate the accuracy of CEUS compared to CT for identifying intra-abdominal injuries in pediatric patients.

Methods: Data were collected via a systematic review of PubMed, EMBASE, Web of Science, and Cochrane with dates up to October 2019. Keyword search terms were generated for contrast enhanced ultrasound, abdomen, trauma, and pediatric population. Two independent reviewers screened text for inclusion. Articles were included if they evaluated injured patients less than 18 years of age and compared CEUS use with CT for the identification of abdominal traumatic injuries. Case series with less than 3 patients and case studies were excluded. Inter-rater agreement was assessed using Cohen’s Kappa test.

Results: A total of 94 articles met search criteria. Reviewers identified three studies (κ = 1) that met inclusion criteria. Study one (Valentino, et al.) was a prospective study including 27 patients, 14 injuries, with a sensitivity of 92.2% and specificity of 100%. Study two (Menichini, et al.) was a retrospective study that included 73 patients, 67 injuries, with a sensitivity and specificity of 100%. Study 3 (Armstrong, et al.) was a prospective study that included 18 patients, 21 injuries, with a sensitivity of 85% and specificity of 98.6%.

Conclusion: CEUS shows promising results for radiation sparing identification of traumatic abdominal injuries in the pediatric population. Injuries identified via CEUS included, liver, spleen, renal, pancreatic, and adrenal injuries. The included studies had a sensitivity of CEUS for pediatric trauma that ranged from 85% to 100% and specificity that ranged from 98.6% to 100%. CEUS shows promise as an alternative to CT but more research is needed.
ABSTRACT

Temporal Variability of Emergency Department Patients that Leave Without Being Seen

David Chiu - Beth Israel Deaconess Medical Center, Mohammad Alghamdi - Beth Israel Deaconess Medical Center, Leon Sanchez - Beth Israel Deaconess Medical Center

Background and Objectives: Emergency Department volume and acuity varies by day of the week and hour of the day. ED patients that Leave Without Being Seen (LWBS) have been associated with low patient satisfaction; it represents a failure to deliver ideal emergency care. The objective of this study is to assess the association between the rate of LWBS as it varies by day of week and hour of day.

Methods: The study is a retrospective chart review of all patients that presented to an academic, urban, tertiary care hospital with an annual ED volume of ~55,000 patients. The study period was from 07/01/2017 through 06/30/2019. The primary outcome measure was rate of LWBS. Data elements collected included patient’s disposition, age, gender, Emergency Severity Index (ESI), hour of arrival, and day of week of arrival. A multivariate logistic regression model with Wald test was used to test for association between LWBS and variables of interest including day of week and hour of arrival. Hour of arrival was split into four groups of morning (6AM to noon), afternoon (noon to 6PM), evening (6PM-midnight) and overnight (midnight to 6AM). The model also included other potential confounding variables.

Results: A total of 109,983 patients were included in this study. The overall average LWBS rate is 1.6% but this fluctuates based on hour of day and day of week. The highest LWBS rate occurs on Mondays at 10 PM with a rate of 3.9%. The lowest LWBS rate occurs on Sunday at 5 AM with a rate of 0%. The Tuesday LWBS rate is highest at 2.1% compared to Sundays which is the lowest at 0.6%. Patients arriving between 10:00-11:59PM have the highest LWBS rate of 2.6% compared with patients arriving between 7:00-7:59AM and 8:00-8:59AM which have a rate of 0.3%. The Wald test from the logistic regression model found a strong positive association between patients that LWBS and arrival between noon to 6PM (p < 0.001) and 6PM to midnight (p < 0.001). Day of week was also a significant predictor of LWBS with Monday, Tuesday and Wednesday (p < 0.001).

Conclusion: There is strong evidence to support that there is meaningful variation in the LWBS based on day of week and hour of day. Factors frequently cited for patients that LWBS are long waits to be roomed and to be seen by a physician. Physician leaders can use this knowledge to compensate by increasing resources to address bottlenecks that might lead to patients LWBS.
ABSTRACT

The Impact of Radiology Over-Reads on Clinical Outcomes of Discharged Emergency Department Patients

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Background and Objectives: Clinical decision making in the ED is often driven by the results of imaging studies. Frequently physicians make clinical decisions on the basis of wet read studies, which contain preliminary findings. These are later reviewed in further detail before a final report is entered, presenting the possibility that discrepancies between the two may alter clinical management. We hypothesized that radiology over-reads would have a minimal effect on patient-oriented outcomes among discharged emergency department patients.

Methods: All ED imaging studies were reviewed for the month of March 2019. Between the hours of 11pm and 7am imaging studies are interpreted by resident radiologists and are reviewed by attending radiologists the following morning. During the remainder of hours, preliminary reads are jointly reported by a resident and attending physician and are over-read at a later time. When an over-read identifies a clinically relevant discrepancy in a discharged patient an ED quality assurance nurse is contacted, who discusses the case with a senior ED physician, who then chooses to call the patient, contact the PCP, prescribe an antibiotic, or call the patient back to the ED for further evaluation.

Results: In March 2019 a total of 6,841 imaging studies were interpreted by the ED radiology department. Among these, 1691 (24.72%) were interpreted between 11pm and 7am, during which resident physicians exclusively interpreted the imaging. In total, 17 cases (0.25%) were identified that altered clinical care. 11 (0.17%) resulted in a medication called into the pharmacy, five (0.07%) resulted in a phone call to the patient, and one (0.01%) resulted in a patient being called back to the ED. The number of over-reads that altered clinical care was not significantly statistically different between studies interpreted by residents as compared to those interpreted by residents and attendings (Fisher exact statistic=1.000).

Conclusion: Radiology over-reads for ED patients rarely alter clinical management in discharged patients. Additionally, radiology resident over-reads are no more likely to change management when compared to other over-reads.
ABSTRACT

The Role of Perceived Diagnostic Certainty on Patient Affect and Satisfaction Following Emergency Department Visit

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Background and Objectives: ED physicians make various assumptions about how patients perceive their ED care, and physicians may modify their practice to improve patient satisfaction. For example, physicians may order additional diagnostic tests to gain greater diagnostic certainty, expedite work-ups to reduce length of stay, and provide careful follow-up guidelines to patients. We sought to determine the impact of these and related factors on self-reported positive emotions and satisfaction with care at the time of discharge.

Methods: We administered a survey to a convenience sample of patients in a single academic tertiary care ED with an annual volume of 55,000 visits. Patients with a chief complaint of abdominal pain, back pain, chest pain, or headache who were listed for discharge from the ED were identified and approached by a research assistant between 8 am and 11 pm. A survey was created using online software and given to each patient for completion on an electronic tablet. We ran a multivariate analysis to test which aspects of a patient’s visit predicted patient affect and satisfaction.

Results: A total of 122 patients (mean age = 49.84, SD = 17.31) were surveyed. Patient perception of diagnostic certainty was a stronger predictor of self-reported positive affect (\( = 0.44, p < 0.001 \)) than the number of diagnostic tests run (\( = 0.04, p = 0.70 \)), number of follow-up guidelines prescribed (\( = 0.05, p = 0.55 \)), length of ED visit (\( < 0.001, p = 1.00 \)), and patient-reported pain (\( = 0.20, p = 0.80 \)). Further, patients’ perceptions of diagnostic certainty significantly predicted satisfaction with the care they received (\( = 0.31, p = 0.001 \)). Importantly, the effect of diagnosis certainty on patient satisfaction was mediated by positive affect; higher diagnostic certainty increased positive affect, which in turn enhanced satisfaction.

Conclusion: We found that just prior to discharge from the ED, patients’ positive affect was more dependent on a subjective sense of certainty of their diagnosis than any of the other variables we studied, including the number of diagnostic tests run. Further, by increasing positive emotions, certainty of diagnosis increases patient satisfaction with care. Further research is necessary to better understand whether certainty may be amenable to messaging by the discharging physician, and whether the patient’s perception matches the physician’s clinical impression.
ABSTRACT

The Use of Metabolomic Profiling to Identify and Understand Signatures of Sepsis Severity

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Background and Objectives:The metabolomic signatures of different sepsis severity levels are not well defined. Primary objective: to find differential metabolites and enriched pathways expressed in a) sepsis patients (of any severity) compared to non-infected controls; and, b) septic shock compared to sepsis or severe sepsis. Secondary objective: to define a metabolomic signature unique to patients with septic shock.

Methods:A prospective, observational study of a convenience sample of adult ED patients with suspected infection and non-infected controls from a tertiary medical center conducted from 9/2012 – 4/2014. Plasma metabolite profiles were measured using liquid chromatography tandem mass spectrometry (LC-MS). We assigned sepsis severity using the original sepsis syndromes criteria of sepsis, severe sepsis, and septic shock. We defined differential metabolites by two criteria; false discovery rate < 0.05, and absolute log2-fold change > 1. MetaboAnalyst 4.0 was used for pathway analysis. We used a derivation and validation cohort and built a diagnostic model using a generalized linear model and calculated area under the curve (AUC) values with 95% confidence intervals.

Results: The discovery cohort had 146 patients: 40% were non-infected controls, 27% sepsis, 17% severe sepsis, and 15% septic shock. The validation cohort had 196 patients: 24% were controls, 28% sepsis, 22% severe sepsis, and 26% septic shock. Sepsis patients presented with 186 different metabolites, the majority of which are glycerophospholipids, acylcarnitines, amino acids, and sphingolipids, and 59 enriched pathways. When compared to sepsis, shock patients showed 107 differential metabolites and 30 enriched pathways. When compared to severe sepsis, shock patients presented 45 differential metabolites and 15 enriched pathways. There were 34 metabolites such as sphingosine 1-phosphate and tryptophan unique to septic shock patients; 13 metabolic pathways were enriched only in septic shock, including 5 vitamin-related pathways. Our diagnostic model for septic shock showed AUC of 0.96 (95% CI: 0.92 - 1.00) in discovery and 0.89 (0.83 - 0.94) in validation.

Conclusion: Our untargeted metabolomics identified differential metabolites and enriched pathways shared across sepsis severities, as well as specific to septic shock. These findings provide novel insights into the metabolomic response in sepsis and septic shock.
ABSTRACT

Time Series Analysis of Congestive Heart Failure Discharges in Florida Post Tropical Storms

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Background and Objectives: Natural disasters can inflict devastating consequences on affected regions. The health systems role in disasters is more reactionary than preventative. Literature in disaster medicine, particularly post hurricanes, typically focuses on the effects of natural disasters after a single event and on acute conditions rather than exacerbations of chronic conditions over time. This study analyzes congestive heart failure (CHF) discharges in Florida post tropical storms from 2007 to 2017 to understand the effects of these storms on health outcomes related to chronic cardiac disease.

Methods: This is a retrospective longitudinal time series analysis of hospital CHF discharges across Florida using the publicly available Healthcare Cost and Utilization Project database. Patients with ICD9 and 10 codes for CHF were included. Due to the seasonality of our data and concerns for auto correlation, the auto regressive integrated moving average (ARIMA) model was used. Seasonal regressor variables and correlated variables such as storm frequency, maximum storm wind speed, average temperature and reports of influenza-like illness (ILI) were added to the model.

Results: This study identified 3,372,993 patients discharged from hospitals in Florida with CHF from 2007 to 2017. Average age in each quarter ranged from 72.2 to 73.9 years, with overall mortality ranging from 4.3% to 6.4%. CHF discharges fluctuated every year with peak discharges from January to March and nadiring from July to September. ARIMA model analysis showed no significant autocorrelation after accounting for seasonal and correlated variables, and an increasing overall time trend. Significant correlation with CHF discharge was found with the average temperature in the state (p=<0.0001), with approximately 531 (SE=62.2) less CHF discharges per average temperature increase, and the percent ofILI reported in the previous quarter (p=0.013), with approximately 1476 more discharges per percent of ILI reported (SE=563.4). However, no significant correlation was found between frequency of storms or the maximum wind speed in each quarter with CHF discharges.

Conclusion: This study suggests no significant increase in overall state burden of CHF discharge diagnosis as a result of recent previous storm occurrences. Further work is warranted to improve management of the chronically ill during and after natural disasters.
ABSTRACT

A Convolutional Neural Network to Identify Recommendations for Additional Imaging in Free-Text Radiology Reports

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Background and Objectives: Incidental findings on radiology studies performed in the ED are common. Usually these findings (e.g. lung nodules) have radiologist recommendations for additional imaging (RAI) to ensure stability. Yet, prior work has shown that the communication of RAI to the patient and primary care providers in the ED is poor. Failure to act on an early finding can result in delayed treatment of potential malignancies, leading to worse patient outcomes, and significant legal liability. Machine learning methods to detect these findings within the free-text of radiology reports can provide the basis of the creation of clinical decision support tools that help ensure that these findings are followed to resolution.

Methods: Radiologists in our ED use specific text macros during the dictation process to indicate the presence of an RAI. We extracted 19,700 free-text radiology reports ordered in the ED, and used the presence of the radiologists macro as the primary classifier for our deep learning model. Canned text placed by the macro was removed from the reports. The data was separated into 14,775 (75%) training reports and 4,925 (25%) validation reports, maintaining class balance. Using only the training data set, a custom word embedding was created and a one-dimensional convolutional neural network was trained using the Keras R package. The algorithm was applied to the testing data set to create predictions of the presence of RAI, and test characteristics of the algorithm were determined.

Results: Approximately 13.8% of all reports contained an RAI. When applied to the validation data set, the algorithm had a precision (PPV) of 0.987, recall (sensitivity) of 0.949, F1 of 0.968, and Area Under the Curve (AUC) of 0.991. Most false positives and negatives were misclassifications by the radiologist (inappropriate use of the macro) and not errors by the algorithm.

Conclusion: Convolutional neural networks that incorporate custom word embedding can effectively identify RAI from the free-text of radiology reports with greater precision and recall than previously reported methods. This method could be utilized to create registries of patients that have RAI that need follow-up, or serve as the foundation for decision support within the EHR at the point of ED discharge.
ABSTRACT

A Rapid Admission Pathway for Critically-Ill Trauma Patients to Address Increased Crowding

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Background and Objectives: Emergency department (ED) crowding is associated with increased mortality and delays in care. To address this challenge, hospital systems have developed processes of care targeting specific patient populations. Critically-ill trauma patients utilize numerous ED resources during prolonged ED stays. As such, we developed a rapid admission pathway targeting critically-ill trauma patients in the ED. Early studies of this pathway were notable for decreased ED length-of-stay (LOS), without measurable negative effects on patient safety. This study investigates the sustainability of the impact of the pathway, as well as its effectiveness in times of increased ED crowding.

Methods: This was a retrospective, cohort, Institutional Review Board-approved study assessing the admission of critically-ill trauma patients to the intensive care unit (ICU) with and without the use of a rapid admission pathway from 2013 to 2018. Through this pathway, trauma patients requiring ICU admission are transported directly from the ED imaging suite to the ICU. We assessed patient characteristics, LOS data, and ED capacity constraints from trauma registry data and ED capacity logs. Statistical analyses included univariate and multivariate testing to compare ICU patients admitted with and without the pathway.

Results: A total of 1,700 patients were included during the study period. Of this cohort, 434 patients were admitted to the ICU using the rapid admission pathway, whereas 1,266 were admitted using the traditional pathway. In bivariate analysis, mean ED LOS was 1.54 hours (95% Confidence Interval [CI]: 1.41, 1.66) for those admitted with the rapid pathway, compared with 5.88 hours (95% CI: 5.64, 6.12) for those patients admitted with the traditional pathway (p<0.01). We found no statistically significant relationship between rapid admission pathway use and survival to hospital discharge. During times of increased crowding, rapid pathway use continued to be associated with reduction in ED LOS (p<0.01). The reduction in ED LOS was sustained when comparing initial results (2013-2014) to recent data (2015-2018).

Conclusion: This study found that a streamlined process to admit critically-ill trauma patients is sustainable and associated with reduction in ED LOS. As ED crowding remains pervasive, these findings support that restructured care processes can limit prolonged ED boarding times for critically-ill patients.
ABSTRACT

A Two-Year Experience Implementing Interprofessional In-Situ Simulation in an Academic Emergency Department

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Background and Objectives: In-situ simulation (ISS) provides an alternative learning environment to a dedicated simulation center. Previous studies show ISS may create opportunities to identify latent system threats, understand culture, and improve team dynamics. However, there are limited resources to guide development and implementation of ISS at academic medical centers. Our objective is to describe the implementation of ISS in a high-volume urban emergency department to understand the requirements and limitations of successful program design.

Methods: Key departmental stakeholders met to define the goals of the experience, identify the physical space and optimal timing, and develop protocols to ensure safe equipment use and subsequent patient care. An ED bay was re-configured to store a simulation mannequin for easy deployment. Simulation faculty designed cases that incorporated departmental clinical guidelines, QA measures, and local case reports. Pilot simulations were used to identify operational barriers and gather participant feedback. We employed an iterative process of review during the academic year to refine the program and identify key themes that seem essential to implementation.

Results: 19 of 22 (86%) scheduled sessions occurred during the academic year. 65 individual learners participated in at least one session, a cohort that included 37 nurses, 16 resident physicians, 8 physician assistants, and 4 allied health professionals. An interprofessional team of educators facilitated the pre-brief, simulation, and structured debriefs, which focused on teamwork, closed-loop communication, and clinical management. Identified themes and practical points for implementation include consideration of session timing, participant buy-in, flexibility, and threats to professional identity.

Conclusion: This report demonstrates the feasibility of implementing an ISS program within the physical and resource constraints of a high-volume ED. Embedding ISS as a routine expectation in health care can be an important element of a comprehensive program to enhance operations and advance the safety climate in a high risk clinical setting.
ABSTRACT

An “Ultrasound-First” Protocol in Acute Diverticulitis is Associated with Reduction in Time and CT Utilization

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Background and Objectives: Although CT scans are highly accurate in diagnosing diverticulitis, they are costly, prolong ED length of stay, and expose patients to ionizing radiation. The objective of this study was to investigate the potential time-saving effect and reduction in CT scan utilization when point-of-care ultrasound (POCUS) was employed as a first-line imaging modality in the diagnosis of acute diverticulitis.

Methods: This was a prospective observational study in patients with suspected diverticulitis who underwent both POCUS and CT in their ED visits. To estimate the impact on CT scan utilization, negative CT scans and those with simple diverticulitis (Hinchey “0”) were considered avoidable. To determine the potential CT reduction associated with an ultrasound-first protocol in ED patients with uncomplicated diverticulitis, we applied the findings from our study to institutional medical records of ED visits for diverticulitis over a period of 3.5 years. To estimate the time-savings of an ultrasound-first protocol, we compared the arrival time to the time in which the CT read was available as compared to the completion of POCUS. Comparisons were made with t-tests and chi-square tests as appropriate.

Results: 72 patients in our study had both POCUS and CT scans. In 35% (25/72), both POCUS and CT showed simple uncomplicated diverticulitis. In 35% (25/72) both POCUS and CT were negative. In 30% (22/72), the CT scan showed complicated diverticulitis, identified an alternative diagnosis or changed management. Overall, CT scans could have been avoided in 70% (50/72) of the cases. When this rate of 70% is applied to the number of patients who had a CT scan for diverticulitis in the ED over a period of 3.5 years, approximately 959 CT scans (70% of 1,370 CT scans), or 274 CT scans annually could have been avoided if POCUS was used as the first-line diagnostic tool. As for the time-saving impact, the average time from arrival to completion of CT and POCUS scans were 5.3 hours (95% CI 4.9-5.7) and 1.1 hours (95% CI 1.0-1.3), respectively. A mean difference of 4.2 hours (95% CI 3.9-4.5) reflects the potential decrease in length of stay for patients in the ED.

Conclusion: In ED patients with uncomplicated diverticulitis, using POCUS as a first-line imaging can substantially reduce the number of CT scans and time to diagnosis. There could be substantial implications and reduction on patient length of stay, radiation, and cost.
ABSTRACT

Attending pediatric emergency department physicians’ use of epinephrine to treat anaphylaxis

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Background and Objectives: Epinephrine is the cornerstone of anaphylaxis treatment. Delayed administration is associated with poor outcomes. However, epinephrine remains underutilized in treating anaphylaxis. We investigated the documented use of epinephrine to treat pediatric patients experiencing anaphylaxis by pediatric emergency department attending physicians (attendings).

Methods: Retrospective chart review of patients under 6 years presenting to a single metropolitan, pediatric emergency department from January 2018 to December 2018. Medical records of patients presenting with various allergic reactions and anaphylaxis coded by relevant ICD-9/10 codes were studied. Records were reviewed to determine whether cases identified as anaphylaxis were treated with epinephrine.

Results: A total of 337 clinical encounters were reviewed with 148 encounters fulfilling NIAID/FAAN Diagnostic Criteria of Anaphylaxis (diagnostic criteria). 104/148 (69.3%) encounters were diagnosed as anaphylaxis by attendings. In 91/104 (87.5%) encounters, patients were treated with epinephrine. Epinephrine administration and attending call of anaphylaxis had a strong correlation (r=0.54). In the remaining 13 (12.5%) encounters, attendings recorded an impression of anaphylaxis, but did not administer epinephrine. In all of these cases, attendings noted that anaphylactic symptoms resolved prior to ED arrival and patients had no recurrence in the ED.

Conclusion: There is a strong correlation between attendings’ clinical impression of anaphylaxis and epinephrine use. We identified two groups of patients experiencing reactions that fulfilled current criteria for anaphylaxis but did not receive epinephrine. The first includes those with resolution of symptoms prior to arrival without recurrence and second were those who had an under diagnosis of anaphylaxis. Therefore, education about NIAID/FAAN Diagnostic Criteria of Anaphylaxis may help to increase correct use of epinephrine for anaphylaxis. Additional studies may be useful to identify appropriate management of patients that present to the ED after resolution of anaphylaxis symptoms.
ABSTRACT

Bacterial Infection Symptom Complex Criteria: Predicting Sepsis from the History of Present Illness

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Background and Objectives: In several prior reports, we classified patients with sepsis based on whether they had “explicit” or “vague” presenting symptoms, finding that treatment was more rapid and outcomes superior for the former group. However, we lacked an optimal decision tool for defining “explicit” symptoms of bacterial infection. Thus, we developed bacterial infection symptom complex criteria (BISCC) and prospectively evaluated their diagnostic test characteristics.

Methods: From a two-year interval, we randomly selected adult ED encounters from our electronic medical record with either systolic blood pressure (SBP) < 100 mmHg or heart rate > SBP (“random cohort”). We also added all others who met CMS SEP-1 criteria for that time period (“SEP-1 cohort”). For both cohorts, we isolated the text of the history of present illness (HPI). Based only on the HPI (reviewers were blinded to any testing, diagnosis and treatment documentation, and to cohort identity), adjudications determined whether BISCC criteria were met: at least one localizing symptom; one inflammatory/constitutional symptom; and no probable alternative etiology. For example, bacterial pneumonia BISCC were: {{cough OR chest pain OR dyspnea} AND {fever OR malaise OR sputum} NOT {sore throat/rhinorrhea OR classic angina OR chemical aspiration}}. BISCC were also developed for urinary tract, intra-abdominal, and musculoskeletal bacterial infections. The study outcome was sepsis per CMS SEP-1 criteria.

Results: There were 138 septic and 592 non-septic subjects in the random cohort, for an estimated sepsis prevalence of 19% (95% CI 16-22%). Pooling results for all four BISCC’s: sensitivity for sepsis was 36% (28-45%); specificity was 95% (93-96%); and positive predictive value (PPV) was 62% (50-72%). For the 793 patients in the SEP-1 cohort, BISCC sensitivity was similar, 35% (32-38%).

Conclusion: In ED patients with at least mild vital-sign abnormalities, only a minority had sepsis. BISCC was an objective tool to identify a subset of patients who likely had sepsis solely on the basis of HPI. BISCC may be useful as a component of a sepsis evaluation protocol, although such a protocol would need to consider the majority of sepsis patients who presented with less specific symptoms and without meeting BISCC.
ABSTRACT

Climate change from the SAEM annual meeting: An environmental model to reduce our impact

Jonathan Slutzman - Massachusetts General Hospital / Harvard Medical School

Background and Objectives: Climate change is the greatest health threat of the century. Healthcare generates 10% of US greenhouse gas (GHG) emissions, leading to dangerous health effects. Conference travel represents 8-15% of academic centers’ total emissions, but little is known about specific conferences and how to reduce impacts. The objectives of this study are to estimate GHG emissions from SAEM19 and model potential mitigations.

Methods: SAEM provided deidentified institution and location data on all 3284 attendees at SAEM19 in Las Vegas. After inferring from institutions for 169 records, 45 (1.4%) ultimately were missing location data, and these were assumed to travel median air and ground distances. GHG emissions were estimated from established emissions factors specific to the category for air and ground miles (by mode), hotel nights (by location), conference-provided meals (by diet), and printed programs (by publication). Sensitivity analyses for airport selection and other factors were performed. Additional scenarios were modeled to estimate impacts, including 1) the same conference with vegetarian menus, 2) two different sites (Chicago and Boston), and 3) five simultaneous sites. Total emissions as well as emissions from air travel, ground travel, hotel stays, printed program, and food are reported in kg CO2e.

Results: For SAEM19, attendees traveled 11.3 million air miles and 72,000 ground miles. Total emissions were 1,800 MT CO2e [95%CI 1,600-2,000] (87% air travel, 1.6% ground travel, 10% hotel stays, 0.1% programs, and 1.3% food). Per-attendee emissions of 560 kg CO2e [95%CI 500-610] represent 3.4% and 11% of annual American and planetary GHG emissions, respectively. Holding the same conference in Chicago or Boston yields reductions of 38% and 37%, respectively. A regional simultaneous conference model with five sites (Boston, Washington, Atlanta, Chicago, and Las Vegas) produces 67% less GHG emissions.

Conclusion: SAEM19 generated large GHG emissions, driven largely by air travel. A location closer to the majority of participants or a regional model with live telecommunications connections would greatly reduce emissions. This study is limited by only addressing five emissions categories, although others are expected to be tiny compared to travel. While an additional limitation, modeling nonstop flights from nearest airports and limiting driving to 180 miles likely under-estimate travel GHG emissions.
ABSTRACT

Clinical Decision Support Reduces Inappropriate Fluoroquinolone Orders for Patients at Risk for Aortic Dissection

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Background and Objectives: An FDA review found that fluoroquinolone use in patients with aortic aneurysms or certain genetic conditions (such as Marfans syndrome or Ehlers-Danlos syndrome) increased the risk of aortic dissection approximately two-fold compared to baseline. We evaluated the effectiveness of an electronic Clinical Decision Support (CDS) tool to reduce the ordering of fluoroquinolones when the patient had a known aortic aneurysm, Marfans syndrome, or Ehlers-Danlos syndrome.

Methods: A CDS tool was developed that would warn clinicians when ordering IV or oral fluoroquinolones when the patient had a known aortic aneurysm or specific genetic conditions (Marfans syndrome or Ehlers-Danlos syndrome) on their problem list. The alert would "pop-up" within the electronic health record, and state the reported increased risk of aortic dissection based on fluoroquinolone use, with a hyperlink to the source publication. From within the alert, the fluoroquinolone order could be removed, or the alert could be overridden. A quasi-experimental, prospective, multi-center study evaluated the effectiveness of the CDS tool in reducing fluoroquinolone ordering under these conditions. In the baseline phase the CDS tool was silent (not visible to end-users), while in the intervention phase the CDS tool was visible. The rate of fluoroquinolone ordering rate between the baseline and intervention phase was compared using the Chi-square statistic.

Results: Over the study period the alert fired on 1,058 patient encounters (42 in the baseline phase, and 1,016 in the intervention phase). The fluoroquinolone ordering rate per encounter was 90.5% (38 of 42 encounters) in the baseline phase, and 59.2% (601 of 1,016 encounters) in the intervention phase. The absolute risk reduction by the CDS tool was 31.3% (21.9, 40.7), odds ratio was 6.56 (2.3, 18.5), and the number needed to treat (NNT) was 3.19 (2.5, 4.6).

Conclusion: A CDS tool that warns ordering clinicians of the risks of fluoroquinolone use for patients at risk of aortic dissection can reduce fluoroquinolone ordering.
ABSTRACT

Clinical Integration of Point-of-Care Ultrasound by EM Residents: A Single Center Mixed-Methods Study

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Background and Objectives: Point-of-Care Ultrasound (POCUS) competence consists of image acquisition, image interpretation and clinical integration. Limited data exists on POCUS usage patterns and clinical integration by emergency medicine (EM) residents. We sought to determine actual POCUS usage and clinical integration patterns by EM residents, and to explore residents’ perspectives on POCUS clinical integration.

Methods: We conducted an explanatory sequential mixed methods study at a PGY 1-4 EM residency. In phase 1, EM ultrasound (US) attendings observed PGY-4 EM residents and documented indications for POCUS. In real-time we evaluated residents’ intent to perform POCUS, actual POCUS usage and competence per patient encounter. Logistic regression was used to analyze variables related to POCUS indication, resident intent and competence. In phase 2, we conducted semi-structured interviews with PGY-4s regarding POCUS usage and clinical integration in the emergency department (ED). Qualitative data was analyzed for themes.

Results: Ten PGY-4 EM residents were observed during 254 high-acuity patient encounters from Dec 2018-March 2019. POCUS was considered indicated for 26% (66/254) of patients, possibly indicated for 12% (30/254) and not indicated for 62% (158/254). When POCUS was indicated, residents intended to perform POCUS only 61% (40/66) of the time. We did not find a statistically significant association between shift volume, shift type or POCUS application and neither resident intent to perform POCUS nor competence. Interviews identified three factors that influence PGY-4’s POCUS clinical integration: motivations to use POCUS, barriers to utilization and POCUS educational methods.

Conclusion: This mixed methods study identified a significant gap in POCUS utilization and clinical integration by PGY-4 EM residents for clinically-indicated cases identified by EM US attendings. As clinical integration is a cornerstone of POCUS competence, it is important to ensure that EM resident POCUS curricula emphasize training on clinical utilization and indications for POCUS while on shift in the ED.
ABSTRACT

Comparing resource databases that could potentially address the social needs of emergency department patients

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Background and Objectives: There is growing recognition of the importance of health-related social needs (HRSN), like housing and food insecurity, in emergency care. Geographically-indexed resource databases represent a promising strategy for emergency department (ED) providers to efficiently link patients to community resources. Several resource databases are available, but no standardized comparisons exist. We compared the scope and accessibility of resource searches from two nationally-available databases, 211 and Aunt Bertha, when applied to a single metropolitan area.

Methods: We conducted standardized searches for community resources related to 4 domains of social needs (food, transportation, housing, and utilities) in both the 211 and Aunt Bertha databases. Searches were applied to 51 ZIP Codes within a single metropolitan area (Boston). For each domain, and for each ZIP code, we recorded the number of resources identified in Aunt Bertha vs 211. To assess general accessibility, we calculated the percentage of resources identified that actually were applicable to the domain queried and accessible to the general population (e.g., eligibility was not limited to a specific demographic, such as veterans). Accessibility is particularly important for ED providers who may not have full information regarding a patient’s potential eligibility at the time of search.

Results: A total of 408 standardized searches were conducted. Averaging across all 51 ZIP codes, Aunt Bertha identified more resources that addressed food insecurity than 211 (n=76 vs 41, respectively) but had less general accessibility (43% vs 68%). Similar results were seen for housing. Conversely, 211 identified more resources and had more general accessibility than Aunt Bertha for the transportation (n=24 vs 22; 87% vs 35%) and utilities (n=40 vs 21, 83% vs 32%) domains. Overall, listed resources were predominately correct by domain but often limited by restriction of the resource to a particular demographic group.

Conclusion: Social resource referral databases vary in their scope and general accessibility, even when applied to the same geographic area. These data suggest that, before investing in these databases, safety-net organizations should carefully appraise databases to assess their usefulness in meeting their population’s health-related social needs.
ABSTRACT

Comparison of CMS SEP-1 Septic Patients With and Without Positive Blood Cultures

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Background and Objectives: The diagnosis of sepsis is dependent on expert but subjective clinician judgement that antibiotics are indicated. We hypothesized that there may be significant differences between septic patients with negative blood cultures [(-)BCx] vs. positive blood cultures [(+)BCx], including evidence of non-bacterial etiology.

Methods: We studied all ED adult patients presenting to our tertiary care hospital over 24 months who met CMS SEP-1 criteria for sepsis. Data for demographics, vital signs, and lab results were abstracted retrospectively via electronic query, while data for symptoms, past medical history, and clinical diagnoses were abstracted retrospectively via chart review. (+)BCx was defined per CDC criteria. After screening with univariable analysis, we applied multivariable logistic analysis to identify independent predictors of (-)BCx.

Results: We identified 188 (+)BCx patients and 443 (-)BCx patients. For investigational predictors quantified by chart review, Cohen’s K ranged from 0.71 – 0.90. Hospital mortality was similar for both groups, 22% (95%CI 16-28) and 22% (95%CI 19-26), respectively. (-)BCx was independently predicted by a clinical diagnosis of pneumonia (OR 3.2, 95%CI 1.7-5.9), lower maximum ED temperature (OR 0.8, 95%CI 0.7-0.9) and lower SOFA score (OR 0.9, 95%CI 0.8-1.0). Post-hoc review of chest x-ray results for (+)BCx and (-)BCx patients with pneumonia revealed equivocal or negative radiographic findings were common.

Conclusion: Diagnosis of pneumonia; lower temperature; and lower SOFA scores were independently associated with (-)BCx, although hospital mortality was similar in both cohorts. One possible explanation is that patients with acute respiratory pathology were diagnosed with presumptive pneumonia and treated with antibiotics, despite lacking true bacterial infection (further supported by the frequency of equivocal findings on chest x-ray in the pneumonia diagnosis subgroup). If validated in other datasets, this could represent a potential confounder for sepsis investigations: a high-mortality subpopulation who would not respond to antimicrobial therapy.
ABSTRACT

Development and Implementation of a Resident-Led Health Equity Curriculum

Farah Dadabhoy; Adaira Landry; Anita Chary; Margaret Samuels-Kalow; Melanie Molina; Emily Cleveland Manchanda

Intro/Background: Resident physicians encounter many forms of discrimination throughout clinical training. Experiences and effects of discrimination may be amplified in the emergency department, as unconscious biases are exacerbated in times of stress, when working with limited information, and in time-pressured situations. Resident-led initiatives to educate peers about health equity, implicit bias and microaggressions can spread awareness and build skills for addressing these forms of discrimination, while simultaneously creating supportive networks of socially conscious peers.

Purpose/Objective: Resident leaders of the Social Emergency Medicine Interest Academy at the Harvard Affiliated Emergency Medicine Residency developed a longitudinal health equity curriculum to 1) raise awareness of race- and gender-based inequities in patient and resident experience, and 2) build residents’ skills in addressing inequities and microaggressions.

Methods: Senior residents led five sessions during residency didactics (Health Equity Rounds), two longer sessions (Health Equity Retreats) and two journal clubs. These were designed based on resident input and a literature review examining similar curricula. Topics included race as a social construct, gender and racial bias in resident education, forms of racism including implicit bias and microaggressions, how bias affects deescalation techniques, and manifestations of structural racism in clinical practice. Feedback was solicited through surveys.

Outcomes (if available): All participants who completed the anonymous electronic post-session surveys (n=29) reported increased understanding of how gender, race and ethnicity affect residents’ experience in the workplace. The vast majority (94%) reported that the interactive session introducing race as a social construct and the microaggressions workshop were ‘very’ or ‘extremely’ useful. Qualitative feedback included the high perceived value of these sessions as well as need for continued discussion and involvement of other key stakeholders.

Summary: Resident physicians can take on leadership roles in teaching colleagues about diversity, equity and inclusion. Resident-led initiatives about these topics educate not only peers but also faculty at their institutions. These efforts have the benefit of promoting awareness of social justice from the ground up, while simultaneously allowing residents to develop leadership skills and relationships with mentors within the Diversity, Equity and Inclusion space.

Our health equity curriculum engaged participants in interactive discussions, leveraging participant experiences to highlight how discrimination affects the work environment. Despite the sensitive nature of these topics, this curriculum was very well received by both resident and faculty participants. Sessions provided strategies for addressing these topics in real time, through research and policy change. Based on feedback from residents, skill-building sessions facilitating practice of verbal interventions to address problematic interactions will be incorporated into future iterations of this curriculum.

Based on our experiences, several considerations emerge regarding resident-led health equity initiatives. First, resident and faculty participation can be optimized by incorporating diversity and inclusion initiatives into existing didactic structures, such as residency conference and journal clubs. Second, residents who lead these initiatives help create space within residency programs for open discussion about diversity and equity in medicine, but simultaneously experience psychosocial stress of engaging with peers, supervisors and mentors on socially sensitive and taboo topics. Furthermore, residents may feel uncertainty about how to best advise peers who approach them about dealing with discrimination and injustice in the workplace. Third, development of these initiatives requires significant investment of time and resources, and calls for a diversity of perspectives. Collaboration among clinical
trainees is paramount. Further work is needed to identify appropriate strategies to support resident physicians who pursue racial justice and health equity work through initiatives such as these.
ABSTRACT

Diagnostic Accuracy of Point-of-Care Ultrasound in Patients with Suspected Diverticulitis: A Prospective Study

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Background and Objectives: CT scan is the standard imaging modality for the diagnosis of acute diverticulitis in the ED. Although CT is highly accurate in diagnosing diverticulitis, it is a costly diagnostic tool that contributes to prolonged ED length-of-stay (LOS) and potentially unnecessary radiation. The primary objective of this study was to determine the accuracy of point-of-care ultrasound (POCUS) performed by EM providers in diagnosing acute diverticulitis in the ED.

Methods: A prospective diagnostic study was conducted at an academic ED over a 4-month period. The study group was comprised of a convenience sample of patients with suspected diverticulitis who underwent both POCUS and CT scan in the ED. POCUS scans were performed by EM attending physicians, ultrasound fellows, or physician assistants who received 1-hour training lecture. The ultrasonographer was blinded to clinical data, laboratory results, and CT scan findings. Sonographic diagnosis of acute diverticulitis was determined with the presence of diverticula with echogenic foci, short segmental bowel-wall thickening > 4mm of the adjacent colon, and echogenic pericolonic stranding. The accuracy of the ultrasonographic diagnosis was compared with the CT scan as criterion standard. The CT scans were reviewed independently by two radiologists blinded to the ultrasound findings. Test characteristics were calculated. Kappa and percent agreement between radiologists were calculated.

Results: The study included 72 patients (median age 59.2 years [IQR 48.4 to 69.1]; 53% female), of whom 47% (34/72) had diverticulitis with 88% (30/34) having a Hinchey classification of “0”. POCUS demonstrated an overall sensitivity of 97.0% (95% CI 84.2-99.9%), specificity of 72.7% (95% CI 54.5-86.7%), PPV of 75.9% (95% CI 64.3-84.7%), and NPV of 96.4% (95% CI 79.5-99.5%) for the diagnosis of acute diverticulitis. None of the cases of complicated diverticulitis and Hinchey 1a and 1b were missed in POCUS exams. There was a perfect agreement between radiologists in dichotomous determination of diverticulitis. (κ=1)

Conclusion: In ED patients with suspected diverticulitis, POCUS is a highly sensitive and reasonably specific diagnostic tool that could be used by EM providers as a first-line imaging modality in the diagnosis of acute diverticulitis.
ABSTRACT

Difficult Intravenous Access as Independent Predictor of Prolonged Length of Stay in the ED

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Background and Objectives: Difficult IV access (DIVA) is common in the emergency department (ED). Multiple studies have reported predictors for DIVA but it is not known how DIVA affect ED throughput and overall length of stay (LOS). We investigated the extent to which time to IV placement in patients with DIVA influences outcomes including time to first lab draw, therapies, imaging study completion, and ED LOS, while accounting for patient age and acuity.

Methods: All ED patients with DIVA seen between 2017-2019 were included. Data was extracted from the electronic medical record, with DIVA defined as patients requiring ultrasound- guided IV access performed by physicians or advanced practitioners (APPs) as opposed to nursing staff alone. ED throughput variables including time to IV placement, laboratory results, IV therapies such as analgesics or fluids, IV contrast administration, and ED LOS were compared between nursing performed landmark-based IVs (RN-IV) and DIVA patients. The 50/75/90 (th) percentiles of door-to-IV times, laboratory test completion, time to therapies, and imaging were entered into a multivariable regression model predicting ED LOS adjusted for subject acuity determined by ED triage area and age. Incidence rate ratios (IRRs) were estimated for all regressors. Quantile regression analysis was used to examine the impact of delayed IV access on ED LOS.

Results: Over the study period, a total of 82,522 subjects were included with a median age of 56, of which 50.7% were female. DIVA occurred in 4.5% of patient visits. For cases with DIVA, patients experienced delays in time to completed lab work (27 min, p-value < 0.001), time to medications (13 min, p-value < 0.001), time to fluids (11 min, p-value < 0.001), and time to complete imaging (34 min, p-value < 0.001). Delays in successful IV placement independently predicted an increased ED LOS (273 min, p-value < 0.001). The magnitude of the effect of IV access delays on ED throughput parameters were exaggerated in DIVA cases with lower clinical acuity and patients of advanced age.

Conclusion: In patients with DIVA, a delay in successful IV access was associated with reduced throughput on multiple measures of ED efficiency. A more expeditious approach to achieving IV access in patients predicted to have DIVA could potentially shorten time to diagnostics and treatment, as well as ED disposition.
Discrepancies in diagnosing anaphylaxis in young children in the emergency department setting

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Background and Objectives: Anaphylaxis is a life-threatening systemic allergic reaction. It is frequently under-diagnosed, especially in infants and toddlers. Our study assessed the impact of age on pediatric emergency department attending physicians’ ability to diagnose anaphylaxis. We also compared modified criteria to the current gold standard, NIAID/FAAN Diagnostic Criteria of Anaphylaxis (current diagnostic criteria), to more accurately identify anaphylaxis in young, non-verbal children.

Methods: Retrospective chart review of patients under 6 years presenting to one urban, pediatric tertiary care emergency department from Jan to Dec 2018. Medical records of patients presenting with allergic reactions and anaphylaxis coded by relevant ICD-9/10 codes were studied and divided into “infant,” “toddler,” and “children” cohorts. We developed a modified definition of anaphylaxis with the goal of better capturing infant/toddler symptoms of anaphylaxis. Records were assessed to determine attendings’ clinical impression of anaphylaxis, and whether each encounter met current diagnostic criteria and/or our study criteria.

Results: A total of 337 clinical encounters were reviewed, with 148 meeting current diagnostic criteria. Of these, 104 were diagnosed by attendings, 27 (61.4%) were infants, 44 (73.3%) toddlers and 33 (74.6%) children (p = 0.2). With our expanded definition of anaphylaxis, 175 encounters met criteria with 112 (64%) diagnosed by attendings, 148 (84.6%) met current diagnostic criteria, and 171 (97.7%) met our study criteria. Attendings recognized anaphylaxis in 29 (50.9%) infants, 49 (71%) toddlers, and 34 (69.4%) children, demonstrating a statistically significant difference across age groups (p < 0.05). Compared to current diagnostic criteria, our study criteria diagnosed anaphylaxis more frequently in the infant cohort (p<0.001), but not in the toddler or children cohorts (p > 0.05 for both).

Conclusion: Attendings recognize anaphylaxis less frequently in infants than in toddlers and children. Use of current diagnostic criteria would increase identification of anaphylaxis. Further, our study criteria may provide increased sensitivity in diagnosing anaphylaxis, especially in infants. Further prospective research should be conducted to better evaluate the effectiveness of our study criteria in diagnosing infant anaphylaxis.
ABSTRACT

Documentation displaces teaching in an academic emergency department

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Background and Objectives: Adverse effects of administrative burden on emergency physicians have been described previously, but the impact of electronic medical record documentation by academic emergency attendings on resident education is not known. In this observational study of a quaternary care academic emergency department, we sought to assess whether the amount of time attending physicians spent on documentation affected the amount of time they spent teaching.

Methods: A fourth-year emergency medicine resident observed 10 attending physicians over 42 hours during 11 shifts, recording their activities every 30 seconds. Activity categories were developed iteratively by the study team and validated through co-observation by an emergency medicine education fellow, with a kappa of 0.89. Activity categories included teaching, direct patient care, documentation, chart review, and socializing/taking breaks, amongst others. Univariate regression analysis was used to assess the relationship between time spent documenting and time spent teaching by attendings, as well as the relationship between these two activities and all other activity categories. This study was deemed quality improvement and therefore exempt from review by the Institutional Review Board.

Results: Results demonstrated that time spent documenting significantly and specifically displaced time spent teaching; every minute spent on documentation was associated with 0.48 fewer minutes spent teaching (p=0.04). In contrast, direct patient care time was not significantly associated with time spent teaching (linear coefficient 0.12, p=0.6). Documentation time was not strongly associated with time spent on any activity other than teaching, nor did any other activity significantly predict teaching time.

Conclusion: These findings suggest that academic emergency medicine attendings may face a trade-off between their documentation and teaching duties, and increasing documentation requirements for these physicians may reduce time spent on education during shifts. Further study is needed to explore how administrative expectations placed on academic emergency physicians might interfere with trainee education.
ABSTRACT

Feasibility of Predicting Hemodynamic State in a Swine Model of Uncontrolled Hemorrhage and Resuscitation

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Background and Objectives: In hypotensive resuscitation for uncontrolled hemorrhage, intravenous (IV) volume is avoided unless hypotension is severe. We hypothesized that a statistical model could predict a subject’s future mean arterial pressure (MAP) during uncontrolled hemorrhage as a function of current hemodynamics and IV volume to be administered; such a model could be used for advanced decision support, to help clinicians decide when to provide IV volume to achieve MAP goals.

Methods: This was a secondary analysis of adult swine during uncontrolled splenic bleeding who, after developing severe hypotensive (MAP < 60 mmHg), received a volume of either saline (NS) or fresh frozen plasma (FFP). Vital signs were documented at quasi-regular intervals, until either subject death or 300 min. Subjects were randomly separated 50%/50% into training/validation sets. Regression models were developed to predict MAP for the subsequent (i.e., future) time-step. Candidate predictors were current and prior vital signs; prior IV volume; and “imminent” IV volume (i.e., volume about to be administered in the upcoming time-step). We compared models developed by backward selection, and by the Hosmer-Lemeshow purposeful selection method.

Results: Median time-steps for serially recorded vital signs were +15 min. 5 subjects survived the protocol; 17 died after a median time of 87 min (IQR 78 – 134). Both modeling methods selected the same predictors: current MAP; heart rate (HR); prior NS; imminent NS; and imminent FFP. We excluded 10 time-steps with “sudden death” events (i.e., MAP decrease >30 mmHg and death all within one single time-step) for which the model was unreliable. The 95% limits-of-agreement between true subsequent MAP vs. predicted MAP were +10/-11 mmHg (for 79 time-steps from training set) and +14/-13 (for 64 time-steps from validation set).

Conclusion: In a swine model of uncontrolled hemorrhage with unstable vital signs, it was possible to estimate the next documented MAP values on the basis of the subject’s current documented MAP; HR; prior NS; and the volume of resuscitation about to be administered. However, the model was unable to predict “sudden death” events. Predictive analytics for clinical care will need to accommodate a wider range of subject physiologies and hemorrhage patterns; these current results establish a benchmark for evaluating future methodologies.
ABSTRACT

Interprofessional Gender Bias During Emergency Medicine Residency Training

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Background and Objectives: Adverse effects of gender bias in medicine are well documented, including among trainees in Emergency Medicine (EM). The extent to which gender bias affects interprofessional interactions is not well understood. This mixed-methods study explores perceptions of gender bias in interactions between EM residents and emergency department (ED) nurses.

Methods: Qualitative data exploring how gender shapes interprofessional interactions were collected through 8 interviews and 2 focus groups with 13 EM residents and 6 ED nurses from two teaching hospitals, balanced by gender and profession. An anonymous electronic survey, developed through an inductive-deductive approach informed by the interviews and focus groups, was then administered to EM residents and nurses at both hospitals. Interview and focus group transcripts were coded for dominant themes using the constant comparative method facilitated by the qualitative data analysis program SaturateApp. Quantitative analysis using Stata® included descriptive statistics and between-group comparisons using Student t-tests for continuous data and two-sample Wilcoxon rank-sum for ordinal data.

Results: Nearly all participants identified gender as an important factor in interprofessional relationships in the ED. Key themes from qualitative data include perceptions of differential treatment and communication styles based on gender. In total, 134 individuals (32%) completed the survey, including 104 nurses (28.7%) and 30 residents (52.6%). Females more frequently perceived interprofessional gender bias than males [mean frequency on 100-point scale 30.9 (95% CI 25.6-36.2) vs 17.6 (95%CI 10.3-24.9)]. However, residents of both genders reported witnessing interprofessional gender bias more frequently than nurses [mean 58.7 (95%CI 48.6-68.7) vs 23.9 (95%CI 19.4-28.4)]. Residents, when compared to nurses, felt gender bias more frequently affects job satisfaction (p=0.002), patient care (p=0.001), personal wellness (p=0.003), burnout (p=0.002), and self-doubt (p=0.017). These differences were largely driven by responses by female residents.

Conclusion: Gender continues to shape interprofessional interactions, including between EM residents and nurses. Gender bias in interprofessional interactions contributes to dissatisfaction in the workplace, particularly for female residents.
ABSTRACT

Massachusetts General and Maniilaq Health — An Academic Medical Center and Rural Hospital Partnership

Ashley Weisman - Massachusetts General Hospital, James Miller - Massachusetts General Hospital, Timothy Buffey - Maniilaq Health Services, N Stuart Harris - Massachusetts General Hospital

Background and Objectives: Health care providers responsible for rural Native Alaskan populations face significant challenges to create healthy communities. Health care metrics in these remote communities are notably poor and demand attention. Efforts to improve health care are often hindered by staffing shortages, limited continuing education that covers the breadth of practice and complex logistics of medicine in rural Alaska, and scant resources to dedicate to quality improvement projects. Academic medical centers are optimally positioned to partner with and support rural Alaska Native health centers in each of these challenges. The Massachusetts General Hospital (MGH) is an urban tertiary care center with a wealth of resources and expertise. Maniilaq Health is a rural health care system staffed by family physicians, advanced practice clinicians (APCs), and community health aids serving 8,000 Inupiat people spread over 40,000 square miles in Northwest Arctic Alaska.

Methods: The MGH Division of Wilderness Medicine established a partnership with Maniilaq Health Services in 2019. Our objectives are: 1) Provide MGH clinicians to staff the emergency department, inpatient service, and outpatient clinics. 2) Deliver an evidence based continuing education course covering topics in emergency medicine, primary care, and behavioral health tailored to the logistics and resources of the Northwest Arctic. 3) Identify areas for improvement and implement durable, quality improvement programs. 4) Introduce medical trainees to rural health care through supervised clinical rotations.

Results: During the first nine months of our partnership, MGH clinicians provided 500 hours of patient care at Maniilaq hospital and village clinics, thirty hours of didactic education, and implemented quality improvement programs in sepsis, trauma, behavioral health, and substance use disorders. MGH physicians precepted five medical and APC students with three students choosing to pursue rural medical practice after their rotation. Clinical work, medical education, and quality improvement projects are ongoing.

Conclusion: A partnership between a large, academic medical center and a rural Native Alaskan medical center can have a rapid and significant impact on staffing, education, quality improvement, and mentorship of medical trainees in this underserved population.
ABSTRACT

Physician-patient gender concordance and emergency department admission rates

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Background and Objectives: Gender disparities in medical care have been tied to variation in both health care utilization and health outcomes. Provider-specific factors may contribute to this variation; prior studies have found that female patients treated by female physicians have higher rates of cancer screening and higher myocardial infarction survival rates. We sought to determine whether emergency department admission rates varied based on patient and physician gender concordance.

Methods: We performed a cross-sectional analysis of Medicare fee-for-service beneficiary emergency department (ED) visits between January 2012 and October 2015. ED visits involving commonly seen ED medical complaints were included. We used Part B claims data to match ED visits to individual physicians and identified physician gender using Medicare’s Physician Compare National Downloadable File. ED visits were categorized into 4 dyads based on physician-patient (Dr-Pt) gender concordance (eg male-male Dr-Pt; female-male Dr-Pt, etc.). Admission rates were defined as the proportion of ED visits resulting in inpatient or observation ward admission. Statistical models including random effects for physician were used to estimate variation in admission rates based on patient and physician gender.

Results: Our sample included 5,778,218 visits seen by 80,782 ED physicians. The majority of physicians in our sample were male (75.3%). The majority of patients in our sample were female (58.4%). Male-female Dr-Pt was the most commonly occurring dyad (45.94%; male-male Dr-Pt 33.23%; female-female Dr-Pt 12.17%; female-male Dr-Pt 8.67%). Comparing dyads, the female-male Dr-Pt dyad had the highest admission rate at 42.6% whereas the male-female Dr-Pt dyad had the lowest admission rate at 36.43%. Holding patient gender constant, female physicians were 4.76% more likely to admit patients (p <0.001). Holding physician gender constant, female patients were 1.81% less likely to be admitted to the hospital compared to males (p<0.001).

Conclusion: Though female physicians had higher admission rates overall, both male and female physicians tend to admit female patients less frequently than male patients. The reasons for this warrant further exploration.
ABSTRACT

Point-of-Care Diaphragm and Lung Ultrasound in Children Receiving Long-Term Mechanical Ventilation

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Background and Objectives: The population of children receiving long-term (>3 weeks) mechanical ventilation (MV) is growing worldwide. No studies have evaluated point-of-care ultrasound and its potential contribution to our understanding of diaphragm and lung function in patients requiring long-term MV. The objective was to describe the findings of diaphragm and lung ultrasound in children with medical complexity requiring long-term MV.

Methods: A prospective convenience sample in a pediatric post-acute care hospital in Boston, MA requiring long-term MV and on a spontaneous breathing trial (SBT) of at least 2 hrs/day were eligible. Changes in diaphragmatic excursion (DE) were evaluated with a phased-array probe (2-8 MHz) in the subcostal view with m-mode. The amplitude of DE from baseline to maximal excursion was measured during quiet breathing and average of 3 measurements used. Diaphragmatic dysfunction was defined as <5 mm of DE as previously reported and/or <5th percentile compared to normative DE weight-based reference values. For lung ultrasound, a linear transducer (5-10 MHz) and simplified protocol of 4-zones (2 on each side) was used. Interstitial syndrome was defined as presence of 3 or more B-lines in a given lung region. All video clips and still images were measured and stored digitally for review. A Cohen’s kappa coefficient (κ) was used to assess inter-rater reliability. Demographics were analyzed descriptively and relationship with diaphragmatic dysfunction and presence of B-lines assessed.

Results: 24 patients were enrolled over 5 months. Mean age at ultrasound was 4.89 years (range 0.25-18), and 92% (22/24) had a G/J feeding tube. Mean duration of MV prior to ultrasound was 1.39 years (range 0.03-9.62) and 46% (11/24) were on a SBT <12 hrs/day. 54% (13/24) had unilateral or bilateral diaphragmatic dysfunction and 82% (18/22) had unilateral or bilateral B-lines. Use of invasive MV was associated with diaphragm dysfunction (rs = .497, p = .017) and lower weight was moderately correlated with the presence of B-lines (rs = .594, p = .002). Inter-rater agreement for diaphragm measurements and presence of B-lines was excellent (Cohen’s κ = .83).

Conclusion: Point-of-care ultrasound revealed diaphragmatic dysfunction and abnormal lung findings in the majority of children receiving chronic MV and potentially could be used to inform decisions about MV weaning or optimizing treatment. Further research is warranted.
ABSTRACT

Predicting Adverse Outcomes in Patients With Pulmonary Embolism by Utilizing Point-of-Care Cardiac Ultrasound

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Background and Objectives: Background: Risk stratification of patients with pulmonary embolism (PE) can guide advanced interventional management and proper disposition. The presence of right ventricular strain (RVS) on point-of-care ultrasound (POCUS) is known to portend a higher morbidity and mortality. However, there are various definitions of RVS. In this study, we sought to assess individual markers of RVS in patients with PE and identify the attributed impact of each echo finding associated with the need for advanced intervention (such as thrombolysis) and 30-day mortality.

Methods: Methods: This was a retrospective study of ED patients with PE who were subject to a Pulmonary Embolism Response Team (PERT) activation over a 5-year time period. POCUS studies were performed by emergency providers as part of patient care. Two physicians with ultrasound fellowship training reviewed all images and assessed for septal bowing, RV hypokinesis, McConnell sign, left ventricular (LV) systolic dysfunction, RV/LV ratio, and tricuspid annular plane systolic excursion (TAPSE). In cases of disagreement, a third physician adjudicated the findings. Outcome variables included: 1) need for advanced intervention and 2) mortality. P-values were calculated by ANOVA for numerical covariates and chi-square test or Fisher’s exact test for categorical covariates as appropriate.

Results: Results: The PERT was activated in 893 patients. Of these, 90 had a confirmed PE and adequate POCUS images available for review. Patients who needed an advanced intervention were more likely to have septal bowing (88% vs 47%, p <.01), McConnell sign (58% vs 33%, p=0.03), and an elevated RV/LV diameter ratio (1.17 vs 0.97, p <.01). We did not find a statistically significant difference in the rate of RV hypokinesis (65% vs 47%, p=.011) or abnormal TAPSE (14.6 mm vs 15.3 mm, p=.51). LV dysfunction was the only statistically significant predictor of 30-day mortality (33% vs 5%, p=.02).

Conclusion: Conclusion: In ED patients with PE, sonographic findings of RVS that are more commonly associated with advanced intervention included septal bowing, McConnell sign, and an elevated RVD/LVD ratio. LV dysfunction was associated with a higher 30-day mortality. These findings can help inform decisions about ED management and disposition of patients with PE.
Relationship between patient and neighborhood-level characteristics and potentially preventable ED utilization

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Background and Objectives: The ED represents a key locus from which to understand local healthcare needs, access and drivers of health. While the relationship between socioeconomic factors and health is well established, the contribution of these factors to potentially preventable ED utilization has yet to be fully characterized or quantified. In this study we present a geospatial analysis of potentially preventable ED visits evaluating their association with patient demographic and neighborhood-level socioeconomic factors.

Methods: We classified the preventability of all ED visits occurring in 2017 to an academic medical center in Massachusetts using the Agency for Healthcare Research and Quality (AHRQ) ED prevention quality indicators (PQI), which are designed to assess preventable ED visits as a marker of community health (converted from ICD-9 to ICD-10). Using patient home address, ED visits were geocoded and matched to the respective census tract (CT). We used descriptive statistics and multivariable logistic regression with error clustered at the CT-level to characterize the relationship between ED visit preventability and patient demographics and CT-level socioeconomic variables.

Results: Of 98,568 ED visits in our sample, 17,214 (17.5%) were classified as preventable ED visits. Overall, patients with ED visits classified as preventable were older and more likely to be black or Latino. Patients with Medicare as their primary insurance accounted for 40.8% of preventable ED visits, compared with 20.6% for other ED visits. Preventable ED visits differed from other ED visits significantly for all but one of the seven tested CT-level socioeconomic variables, percentage of households with no car. In multivariable logistic regression, only one of the seven tested socioeconomic variables, percentage of adults without a high school degree, was significant with an odds ratio of 1.04 (95% CI: 1.03 – 1.06) for each increase in decile.

Conclusion: In addition to being the first published use of the AHRQ ED PQI diagnosis criteria using ICD-10, this study further demonstrates the importance of local drivers of health and the need for strengthened community health efforts in areas with high measures of socioeconomic stress. Further research is needed to further elucidate the association between education and potentially preventable ED utilization in particular, and the modifiable factors underlying this relationship.
ABSTRACT

Screening for health-related social risks/needs: Patient satisfaction with verbal v. electronic strategies

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Background and Objectives: The emergency department (ED) is an ideal setting for examining the impact of health-related social risks/needs on health, health services utilization, and treatment adherence. However, the best strategy for social risks/needs screening in the ED is not yet known. In particular, questions remain about patient satisfaction. The goal of this project was to compare patient satisfaction with verbal v. electronic strategies for screening for social risks/needs, using a screener developed by our health system for primary care.

Methods: Qualitative interviews were conducted with ED patients randomized to a verbal (oral) or electronic (iPad) screening strategy in a large urban academic ED. Recorded interviews immediately followed the screener. Participants were purposively sampled to balance recruitment across 4 groups defined by health literacy scores (high v. limited) and screening strategy. Domains examined included facilitators and barriers to screening and comfort with screening modality. Interviews were transcribed, coded, and themes identified using a modified grounded theory approach.

Results: A total of 236 patients were randomized to a verbal or electronic screening strategy and purposively sampled for a follow-up qualitative interview. Of the 27 participants who completed the qualitative interview, distribution across each sampling group was as follows: 7(26%) high health literacy (HL)-verbal, 4(15%) limited HL-verbal, 7(26%) high HL-electronic, and 9(33%) limited HL-electronic. Identified themes included facilitators and barriers to screening (e.g., potential for embarrassment, feasibility and appropriateness of screening in the ED), comfort with screening modality (e.g., technological and reading/writing proficiency requirements for electronic strategy), missed social risks/needs (e.g., interpersonal stressors, domestic violence), and screener question ambiguity.

Conclusion: Participants were largely satisfied with the screening modality they experienced and identified barriers relevant to the alternative modality as well as missed social risks/needs. This study highlights the advantage of multimodal screening options for patients and the need for more comprehensive social risks/needs screening tools.
ABSTRACT

Screening for social risk: A randomized controlled trial of verbal v. electronic strategies

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Background and Objectives: Emergency departments (EDs) are increasingly recognizing the important role of social risks, such as housing or food insecurity, in patient health outcomes. To date, the majority of research on strategies to identify social risks has been conducted in primary care and the optimal strategies for screening in the ED remain to be described. In particular, given the time and resource constraints of the ED, an electronic patient-completed strategy may be preferable. The goal of this project was to compare verbal v. electronic strategies for screening for social risk, using a screening tool developed by our health system for primary care.

Methods: Patients (or parents of pediatric patients) were eligible for inclusion if they spoke English or Spanish, age ≥ 18 years, and had capacity for consent. Participants were enrolled by a bilingual research assistant during shifts that were balanced across time of day and day of week. Participants were randomized to verbal delivery of the social risk screening v. iPad self-completion of an electronic version of the same questions. The primary outcome was satisfaction with the screening process. We used multivariable regression models and an intention-to-treat analysis.

Results: 554 patients were assessed for eligibility of which 236 were randomized (121 to electronic and 115 to verbal). Of these, 53(23%) were Hispanic, 14(6%) were non-Hispanic black and 137(58%) were non-Hispanic White. 89(38%) had state/public insurance and 134(57%) had private insurance. 158(67%) had an identified social risk and 191(81%) reported satisfaction with the tool. Screening modality was not associated with satisfaction after adjustment for language, health literacy and HRSN [aOR 0.74 (95% CI: 0.32, 1.71)].

Conclusion: Screening modality was not associated with overall satisfaction with the screening process. Future ED-based screening efforts can consider use of electronic tools to streamline the screening process and expand scalability and sustainability.
ABSTRACT

Simulation-Based Education to Explore Practice Patterns and Medical Knowledge of Advanced Practice Providers

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Background and Objectives: Physician assistants (PAs) and nurse practitioners (NPs), collectively referred to as advanced practice providers (APPs), are a growing part of the clinical workforce at academic medical centers (AMCs). Most APPs enter practice needing specialty- or site-specific training. However, there is no available data related to the learning needs of EM APPs. Simulation-based education (SBE) has been shown to be effective in identifying learning needs of medical students and residents. Therefore, to understand the learning needs of our EM APPs, we designed an interprofessional SBE initiative. We also assessed its efficacy as a method for improving medical knowledge.

Methods: We queried electronic medical records to determine our ED’s most common admission diagnoses and guide us in creating a simulation case-mix that is specialty- and site-specific. Each session included five simulation cases with debriefings led by simulation educators; pre- and post-simulation multiple-choice questions (MCQs); and critical-action checklists to explore practice patterns. Teams of 2-3 APPs worked through each case followed by a medical knowledge assessment completed by each individual APP. Learners completed the same knowledge assessment two weeks after the simulation to assess retention.

Results: 28 teams made up of 67 unique/individual learners (48 PAs, 19 NPs) participated in the program, which facilitated 134 learner experiences (total number of learner participants in all sessions) over 14 sessions. 183 of 200 (92%) critical action steps were completed. The proportion of correctly answered MCQs increased from 60% before the simulation training to 82% immediately after the simulation. Two weeks after the session learners correctly answered 81% of MCQs and most (80%) reported caring for a patient with a presentation similar to a case presented in the simulation lab.

Conclusion: We present an SBME initiative that explores EM APP practice patterns and evaluates medical knowledge. EMR can be used to create a simulation trainings that are both specialty- and site-specific. Our data suggest that SBME can improve APP’s medical knowledge with on-going retention. 92% of critical action checklists were completed with 100% accuracy before any teaching or intervention. This suggests that APPs can provide some of the critical steps in the diagnosis and management of common ED complaints and provide value to AMCs.
ABSTRACT

Supply and Demand of EM Board-certified Emergency Physicians by State, 2017

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Background and Objectives: Although opinions vary, there is a likely shortage of EM board-certified emergency physicians (BCEPs) in the U.S., especially in rural areas. Given the sparse data on this topic over the past decade, we updated our 2005 workforce assessment. Our objective was to estimate the BCEP supply and demand by state, while accounting for variation in ED visit volumes and population densities. We hypothesized that the supply of BCEPs continues to not meet the estimated demand, particularly in more rural and less populated states.

Methods: To estimate state demand, we applied the methodology from our 2005 analysis to calculate full-time equivalent (FTE) BCEP demand for each ED. Briefly, the 2017 National Emergency Department Inventories-USA provided visit volumes for all EDs, while the American Board of Medical Specialties supplied the 2017 number of BCEPs per state. Assuming at least one BCEP should be present 24/7 in each ED (requiring 5.35 FTEs minimum), we calculated the total FTEs required by dividing each ED’s visit volume by the estimated average visits seen by a BCEP (3,548 visits per year), and then summed FTEs by state. The U.S. Census Bureau and the American Community Survey provided state demographic characteristics. We used multivariate linear regression to examine the association between state demographics and the density of BCEPs per state, and compared 2017 results to our prior 2005 analysis.

Results: There were 40,716 total BCEPs in 2017, fulfilling 77% of the estimated national demand. This was an increase compared to 2005, with 23,035 and 58%, respectively. The 2017 supply ranged from 24% of demand in North Dakota to 142% in Hawaii. The number of BCEPs per 100,000 civilian population ranged from 5.9 in Alabama to 31.7 in Washington, DC. The Midwest and South had the lowest densities of BCEPs (< 0.001). States with a higher density of BCEPs were associated with a lower percent rural population (β = −0.10, p = 0.02). Compared to 2005, the absolute national shortage of BCEPs improved by 29% (from 16,990 to 12,128), however, the shortage worsened or remained the same in one-fifth of states.

Conclusion: While the total number of EM BCEPs nearly doubled between 2005 and 2017, a shortage of EM BCEPs persists. The supply and demand vary greatly by state, and worsening shortages in several states show that the distribution of BCEPs is not meeting demand across the U.S.
ABSTRACT

The Effect of Depth, Gain, and Focus Position on Sonographic B-lines

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Background and Objectives: B-lines are hyperechoic reverberation artifacts originating from the pleural line in point-of-care lung ultrasound. They provide semi-quantitative assessment of pulmonary edema and interstitial syndrome. Extensive heterogeneity exists in defining the optimal settings to identify B-lines. We aimed to identify the best depth, gain, and focus position for B-line visualization.

Methods: In this prospective observational study, we recruited patients presenting to the emergency department with interstitial syndrome who underwent point-of-care lung ultrasound as part of their diagnostic workup and were identified to have B-lines. A curvilinear transducer was used to assess for B-lines in a single rib interspace window. Video clips of the same window were acquired by changing three parameters: depth (6, 12, 18, and 24 cm), gain (10%, 50%, and 90%), and focus position (at the pleural line or at half of the scanning depth). All combinations were used for a total of 24 unique settings. Clips were scored as positive for B-lines if 3 or more B-lines per clip were seen, and image quality was assessed using a 5-point Likert scale. B-line counts were analyzed with two-way ANOVAs with Bonferroni correction.

Results: In total, 384 images from 16 patients were analyzed. Gain settings of both 50% and 90% showed improved B-line identification compared to 10% (p<0.0001 for both measures), no difference between gains of 50% and 90% were noted. Both depth settings of 12 cm and 18 cm had improved B-line identification when compared to 6 cm (p = 0.0012, and 0.0306 respectively). Increasing depth to 24 cm failed to demonstrate additional improvement. Focus position did not independently impact B-line identification. Image quality was optimal at a gain setting of 50% which showed improvement in quality over gains of 10%, and 90% (p<0.0001 for both measures). Depths of 12 cm and 18 cm yielded improvement in image quality when compared to a depth of 6 cm (p =0.0001 and p<0.0001 respectively). Placing the focal point at the pleural line compared to mid-field modestly improved image quality (p =0.038).

Conclusion: Optimal settings for visualization of B-lines on lung ultrasound using a curvilinear probe include a depth of 12-18 cm, a gain of 50%, and a focal position at the pleural line. Establishing optimal settings can standardize sonographic assessment of lungs for B-lines and can improve diagnostic accuracy.
ABSTRACT

The impact of point-of-care ultrasound in preventing and reducing morbidity and mortality in emergency medicine

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Background and Objectives: Point-of-care ultrasound (POCUS) is an essential tool in the timely evaluation of an undifferentiated patient in the emergency department (ED). The study’s primary objective was to determine the perceived impact of POCUS in high-risk cases presented at emergency medicine (EM) morbidity and mortality (M&M) conferences.

Methods: This retrospective survey of cases submitted to M&M at an EM residency program which spans two academic EDs, over one academic year. PGY-4 residents who presented M&M cases at departmental sessions were surveyed on perceived impacts of POCUS on individual patient outcomes. We evaluated POCUS use and indications while the POCUS was utilized.

Results: Over the 12-month period, a total of 667 cases from 18 M&M sessions were initially reviewed by 15 PGY-4 residents. 75 of these cases were selected by the M&M committee for review and presentation. POCUS was used in 26% (20/75) and not used in 73% (55/75). In cases where ultrasound was not used, retrospective assessment determined that it POCUS was “likely to have reduced or prevented the M&M in 45% (25/55). Of these 25 cases, the majority of POCUS applications that could have helped were cardiac (32%, 8/25) and lung (32%, 8/25) ultrasound. If performed, POCUS would have been most useful in identifying missed diagnoses (92%, 23/25), and decreasing the time to diagnosis (92%, 23/25). Patients with cardiopulmonary chief complaints and abnormal vital signs were most likely to benefit.

Conclusion: In this retrospective review, POCUS had the potential to reduce or prevent morbidity and mortality in 45% of cases in which it was not used, most commonly by identifying missed diagnoses. Cardiac and lung ultrasound were felt to be most useful applications, especially in patients with cardiopulmonary complaints and in those with abnormal vital signs.
ABSTRACT

Ultrasound Assessment of Carotid Flow Time & Volume in Predicting Fluid Responsiveness in Patients with Sepsis

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Background and Objectives: An increasing amount of evidence supports the use of carotid flow time (CFTc) and volume (CFV) for detecting volume status in patients with hypovolemia. We sought to assess whether sequential ultrasound measurements of CFTc and CFV permit an accurate prediction of fluid responsiveness in patients with sepsis.

Methods: A prospective observational study was conducted in an academic Emergency Department over one year. Hypotensive (SBP<90) patients ‘at risk’ for sepsis (as defined by an ED Sepsis Screen Protocol) and in whom the plan was to treat with IV fluids were eligible for enrollment. IV fluid resuscitations and standard sepsis management were performed as routine clinical care. Ultrasound measurements of CBF and CFTc were performed at time zero and at two hours or upon completion of 30 mL/kg of IV fluid therapy. All ultrasound measurements were repeated after a passive leg raise (PLR) maneuver. Emergency physician sonographers were blinded to the clinical and laboratory findings. We recorded the correlation between sequential carotid flow measurements and inadequate fluid responsiveness defined as persistent hypotension requiring vasopressor administration within 12 hours of ED arrival. A Wilcoxon rank sum test and Lehmann Hodges median shift were used to compare interval data. Simple linear regression was used to assess correlation between interval data results.

Results: Among 69 patients the mean age was 66 years of age. 48% of patients were female. 36 patients were categorized as clinical fluid responders and 33 were non-responders. On the initial ultrasound, there was a significant increase in CFTc with PLR (9.7 ms, 95% CI 5.8 to 13.6). There was no significant change seen in CBF with PLR (3.3 mL/min, 95% CI -15.2 to 23.6). Change in CFTc and CFV, with or without PLR, were not predictive of fluid responsiveness (p=0.53 and 0.23 respectively). The changes in patient CBF (p=0.74) and ΔCFTc (p=0.91) from initial ultrasound measurement to 2 hours were neither associated with the volume of weight-adjusted IVF administered nor with fluid responsiveness.

Conclusion: In patients with suspected sepsis, the lack of correlation between an increased CFTc and CFV and IV fluid volume suggested that it is unlikely that carotid flow parameters can determine patients who may benefit from further IV fluid therapy after initial fluid bolus.
ABSTRACT

Variation in emergency department physician tendency to admit based on patient demographic factors

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Background and Objectives: Physician decision-making is an important contributor to variation in emergency department (ED) admission rates across and within hospitals, but factors affecting the decision to admit independent of clinical status have not been well studied. We sought to determine whether ED physician tendency to admit varies by patient race, gender, or socioeconomic status (SES).

Methods: We conducted a cross-sectional analysis of a nationally-representative 20% random sample of Medicare fee-for-service beneficiaries evaluated in the ED from January 2012 to October 2015. We included ED visits that involved medical diagnoses that had at least 30,000 visits over the study period and that could be linked to individual physicians using Part B claims. Our primary outcome was admission rate defined as the proportion of patients admitted versus discharged from the ED. Admission rates matched to individual physicians defined admission tendency. Variables of interest included patient race (white, black, Hispanic, other), sex, and SES as indicted by whether patient was dually eligible for Medicaid. We estimated statistical models including random effects for physician along with fixed-effects for hospital to assess within-hospital variations in physician tendency to admit based on variables of interest.

Results: Our study sample included 5,778,218 visits seen by 80,782 physicians at 3,480 EDs. Patients were predominantly female (58.4%) and white (76.7%), and 26% were eligible for Medicaid. The median overall admission rate across physicians was 36.8%. Rate of admission was highest for male (41.0% vs 37.8% for female), white (39.9%, black 35.2%, Hispanic 37.5%; other excluded), and Medicaid non-eligible patients (39.7% vs 37.6 dual-eligible). There was moderate to high correlation in physician admission rates across patient SES (0.72), gender (0.83), and race (0.98 – 0.99). In other words, individual physician tendency to admit did not vary significantly based on patient race though there was minor variation based on patient gender and SES.

Conclusion: Though there appear to be differences in the overall rates of admission by patient demographic factors; patient SES, gender, and race do not appear to significantly impact an individual ED physician's tendency to admit. Other factors must be explored to explain variation in ED physicians' decision-making around admission.
INNOVATION

Real-time Dashboards of Bedside Ultrasound and Procedures to Track Emergency Medicine Resident Competencies

Sayon Dutta; Dustin Mcevoy; Paul Ginart

Intro/Background: Self-reporting by emergency medicine residents of bedside procedures and ultrasounds performed likely underrepresents their actual clinical experience as it requires additional manual effort. Implementation of Electronic Health Records (EHRs) allows the automated extraction of this data in near real-time, giving residency directors a more accurate and granular understanding of their resident’s procedural experience over time, with the ability to identify any gaps that may exist.

Purpose/Objective: We aimed to create an automated dashboard of bedside procedures and ultrasounds performed by residents across our hospital system. We designed views to describe the procedural experience per resident, as well as comparisons of residents within each academic year.

Methods: We extracted the standardized bedside procedure notes (used in the ED and inpatient areas) from the EHR, and recorded the date of service, the authoring resident, and supervising attending. For bedside ultrasounds, we recorded what types of ultrasounds were performed, and if the study was positive, negative, or indeterminate. The data was presented graphically using Tableau, which allows interactive filtering by resident, date range, and specialty of resident. The data refreshes every evening automatically.

Outcomes (if available):

Summary: Automated dashboards provide more accurate summary statistics of the procedural experience of emergency medicine residents without relying on self-reporting. These tools can replace the need for manual data entry by residents in procedure logging systems.
INNOVATION

VLENS: Mapping the intersection of Utilization, Resources, and Health Related Social Needs

Henry Ashworth; Gia Ciccolo; Carlos Camargo; Margaret Samuels-Kalow

Intro/Background: Health-related social needs (HRSN), such as food or housing insecurity, are common among emergency department (ED) patients and have a significant impact on a patient’s health. While there is interest among ED providers to address HRSN, workplace constraints and a lack of streamlined processes are major barriers. User-friendly interventions that incorporate local resources and geography are needed to create efficient referral pathways between the ED and community resources.

Purpose/Objective: Our objective was to develop an interactive tool, Visualization Linking Emergency Needs and Services (VLENS), to map ED utilization, community resources, and HRSN to be used by policy makers, hospital management, and ED providers to better address HRSN. The objectives were to: (1) obtain publicly-available data regarding demographics (e.g. poverty), resources (e.g. housing) and hospital utilization, (2) create an interactive mapping tool for information display, and 3) optimize the tool for use in the ED.

Methods: Publicly-available data on ED utilization, community resources, and HRSN were collected from a variety of community, state, and national databases. Sources included the American Census Survey, 211 Community Resources, the Centers for Disease Control and Prevention, and the Massachusetts Department of Public Health. Data were cleaned and uploaded to an ESRI ArcGIS platform. The tool was then refined and updated with feedback from ED providers and data visualization experts.

Outcomes (if available): A user in the ED can graphically identify resources (e.g. utility assistance, housing, community health centers) to meet a patient’s needs. The tool allows for these resources to be identified either close to a patient’s residence or on local transportation routes. In addition, policy or hospital management can use VLENS to identify areas with utilization and resource mismatches to develop geographic- and topic-specific interventions. The tool under development is available at: http://maps.cga.harvard.edu/vlens/.

Summary: EDs are the primary point of care for populations with multiple social needs and a lack of access to care. However, better tools are needed to help increase the ease, efficiency, and accuracy of connecting patients to community resources once their social needs are identified. To address this need, we developed VLENS, an online mapping tool that uses publicly-available data to help identify specific resources to meet a patient’s needs. The current draft of the tool incorporates local, state, and national level data on community resources, ZIP code level demographics, and hospital utilization. These different layers of data can be added and removed to see the intersection of different variables or identify the closest resources to a patient. A subset of this tool is currently being deployed in the Massachusetts General Hospital ED, with plans to further expand its use to other healthcare organizations in the greater Boston area.

VLENS offers a novel depiction of multiple data sources for utilization by ED providers, healthcare management, and policy makers. At the bedside, VLENS can assist in caring for patients with multiple HRSN. Accountable Care Organizations and healthcare organizations could use VLENS to identify populations with high need and utilization. Finally, VLENS can be used by policy makers to study the intersection of utilization, resources, and HRSN. Future work includes examining the effect of using VLENS on clinical outcomes and creating a package that could be deployed by EDs nationwide.
ABSTRACT

Concordance Between Patient Self-Report and Clinician Perceptions of Patient Activation

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Background and Objectives: The Patient Activation Measure (PAM-13) is a self-report tool that was designed to assess patients’ knowledge, skills, and confidence in managing health and healthcare. Data on concordance between patients’ own self-reports and clinicians’ assessments are not available. Therefore, we sought to investigate agreement between emergency department (ED) patients’ and clinicians’ assessments of patient activation.

Methods: We administered the PAM-13 to a convenience sample of adult patients receiving care in our Level-I tertiary ED. Excluded were those who could not read English or whose medical/cognitive status precluded participation. A clinician investigator answered questions regarding their agreement with the participant’s self-report and reasons for any discordance. Patient self-reports were paired with investigator assessments.

Results: 165 ED patients participated in paired assessments; median age 65 years (range 21-95); 81 (50.3%) female. PAM-13 scores ranged from 40.7 to 100, mean 68.0 (SD 13.13, 95% CI: 66.0-70.1). Scores stratified participants into four levels representing increasing degrees of activation: L1 (Disengaged/Overwhelmed) – 7 (4%), L2 (Becoming Aware, Still Struggling) – 19 (12%), L3 (Taking Action, Gaining Control) – 72 (45%), and L4 (Maintaining Behaviors, Pushing Further) – 64 (40%). The clinician investigator agreed with the participants self-report in 119 cases (72.1%) and disagreed in 46 cases (27.9%). Reasons for discordance included: patient may not be a reliable reporter (n=24, 14.5%), patient is unable to care for themselves (n=23, 13.9%), patient is not fully engaged with the PAM-13 survey or may not understand the questions (n=14, 8.5%), someone other than the patient answered the survey (n=2, 1.2%), patient is fully reliant on a caregiver (n=2, 1.2%), and patient did not complete the full survey (n=2, 1.2%).

Conclusion: In our setting and sample, a clinician investigator agreed with the patient’s self-reported activation level 72% of the time. In 28% of cases, the investigator disagreed with the patient’s self-report for reasons that included unreliability, clear inability to care for oneself, dependence on a caregiver, and difficulty understanding the meaning of the PAM-13 items. Prior to widespread clinical use, additional investigation examining patient understanding of the PAM-13 items is warranted.
ABSTRACT

Psychometric Properties of the Short Form Patient Activation Measure When Used with Adult Emergency Patients

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Background and Objectives: Patient engagement with healthcare is important as engaged patients make more informed healthcare decisions, incur lower expenses, and have improved outcomes. Patient activation, defined as knowledge, skills, and confidence in managing health and healthcare, is closely linked and is measurable using the short form Patient Activation Measure (PAM-13). While evidence supporting the PAM-13s validity has been established in the general and hospitalized populations, its psychometric properties have not been evaluated when used in the emergency setting (ED). Thus, we sought to assess the PAM-13s psychometric properties when used in the ED setting.

Methods: We administered the PAM-13 to a convenience sample of adult patients receiving care in our Level-I tertiary ED. Patients were excluded if they could not read English or if their medical or cognitive condition precluded participation. Analyses included: a) internal consistency reliability using Cronbach’s alpha coefficient and item analysis, b) principle components analysis (PCA) with Varimax rotation and Kaiser normalization and c) internal consistency reliability of the components identified through PCA.

Results: 200 patients participated in the study, 98 (49%) were female, median age 64 (range 21-95). PAM-13 scores ranged from 39.7 to 100, mean 67.2 (SD 13.25, 95% CI: 65.3-69.0). The initial standardized Cronbach’s alpha coefficient for all 13 items was 0.88, indicating high internal consistency reliability. One item displayed a low corrected item-to-total correlation (0.247) but was retained due to limited influence on alpha if deleted. The items were subjected to PCA yielding a two-component solution explaining 51.9% of observed variance. Cronbach’s alpha coefficient for the individual components were 0.87 (Component 1, 7 items) and 0.73 (Component 2, 6 items), indicating that the subscales may be used independently to assess unique aspects of patient activation.

Conclusion: Results suggest that the PAM-13 is psychometrically sound when used with adult ED patients. While the PAM-13 holds promise as a tool for evaluating activation in the ED, additional research in needed to assess the relationships between patient characteristics and scores on the PAM-13. In addition, evaluation using methods grounded in Item Response Theory (IRT) are warranted as the PAM-13 was developed using an IRT-model.
ABSTRACT

Relationships Between Patient Activation, Demographic and Visit Characteristics in the Emergency Setting

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Background and Objectives: The Patient Activation Measure (PAM-13) was designed to assess patients’ knowledge, skills, and confidence in managing health and healthcare as higher levels of activation and care engagement have been associated with improved outcomes. Little is known about activation in emergency department (ED) patients; thus, we sought to determine baseline levels of activation and associations with patient and visit characteristics in the ED setting.

Methods: We administered the PAM-13 to a convenience sample of adult patients receiving care in our Level-I tertiary ED. Patients were excluded if they could not read English or if their medical/cognitive condition precluded participation. Activation levels were collapsed (low vs. high activation) and were linked to patient and visit characteristics using electronic query of the health record.

Results: 200 patients participated in the study, 98 (49%) were female, median age 64 (range 21-95). PAM-13 scores ranged from 39.7 to 100, mean 67.2 (SD 13.25, 95% CI: 65.3-69.0). Scores stratified participants into four levels representing increasing degrees of activation: L1 (Disengaged/Overwhelmed) – 11(6%), L2 (Becoming Aware, Still Struggling) – 27(14%), L3 (Taking Action, Gaining Control) – 89(45%), and L4 (Maintaining Behaviors, Pushing Further) – 73(37%). Significant differences in activation were not noted based upon age, gender, payor type, mode of arrival, or ESI level (p>0.05 for each). Differences were also not noted based on visit characteristics including being seen in critical care, a hallway space, the rapid or clinical decision units; receiving a radiograph, computed tomography or magnetic resonance imaging; or having a 7- or 30-day revisit (p>0.05 for each). The number of laboratory or imaging procedures completed and ED length of stay also did not vary by activation level (p>0.05 for each).

Conclusion: In this sample, we did not observe significant differences in baseline patient activation based upon demographic and visit characteristics. Understanding that baseline patient and visit characteristics do not seem to influence activation supports the notion that the PAM-13 may be a useful tool for assessing activation in a wide range of adult ED patients. While the majority of participants (58%) reported higher levels of activation, concordance with actual health-supporting behaviors was not evaluated.
ABSTRACT

Wellness in Teaching: a dynamic educational intervention to improve faculty performance

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Background and Objectives: For providers in an academic setting, there are expectations for teaching that can add stress to the emotional demands of clinical practice. There is scarce data for the role of curricula aimed at prevention of burnout in academic clinicians. The objectives of this curriculum were to educate faculty on wellness theories and tools to specifically improve flow, mindfulness, and resilience. By the end of the course participants should be able to analyze their own applications of wellness within their practice.

Methods: This was a 6-week pilot program containing 3 modules targeting all clinicians and learners in the MaineHealth system. Each interprofessional module was 2 weeks in duration consisting of two 2-hour in person workshops consisting of lecture, small group work and question and answer methods that taught the wellness concepts of flow, mindfulness and resilience. Regular yoga practice was used to reinforce the practical application of these concepts. We had an n=9. Participants were asked to practice yoga twice a week at a minimum. Pre and post qualitative surveys and validated scales of these concepts were used to assess the effects of the program. Changes in scores were analyzed using pair t-tests. Two coders conducted the qualitative analysis.

Results: We found four themes emerge in our qualitative data: being more mindful, being less reactive, work/life balance, and applying strategies to teaching. Quantitative analysis of the 3 validated scales showed statistically significant improved scores in mindfulness, resilience, and flow.

Conclusion: Qualitative themes were consistent with the goals of the course and feedback was positive. Conscious changes to workflow in the teaching environment were already taking place by the end of the course. Participants reported, one of the main barriers for clinicians participating in the program was securing enough time to commit to the program. This program increased educators’ sense of well-being and teaching self-efficacy.
ABSTRACT

Prehospital Use of Ketamine versus Midazolam for Sedation in Acute Agitation

Charles Johndro - Hartford Hospital, Sean Caffyn, Jasmine Chen

Background and Objectives: Acute agitation during the prehospital transport of a patient can be dangerous and often requires pharmacologic treatment for sedation. Recent evidence has shown that intramuscular (IM) ketamine results in rapid, effective sedation but may come with a higher intubation rate. The purpose of this study is to compare the efficacy and safety of IM ketamine versus IM midazolam when used as a sedating agent in this setting.

Methods: This was a retrospective cohort study of agitated patients who were transported by EMS to Hartford Hospital between February 9, 2017 and July 31, 2018. Patients ages were between 18 and 89 years old and had an initial Richmond Agitation-Sedation Scale (RASS) score of at least 3. They were excluded if they were transported to a hospital other than Hartford Hospital. Primary endpoint was the incidence of endotracheal intubation occurring during transportation and within one hour after arrival to the emergency department (ED). Secondary endpoints included percentage of patients who achieved an improved RASS score post drug administration, the use of additional sedating agents, airway and breathing support during transportation and within one hour after arrival to the ED, and differences in adverse events.

Results: Sixty-eight patients in the midazolam group and 66 patients in the ketamine group were included in the final analysis. There was no statistically significant difference in the endotracheal intubation rates between the two groups (6.1% versus 2.9%; p = 0.383). More patients in the midazolam group achieved target RASS score of -1, 0, or 1 post drug administration (41.2% versus 19.7%; p = 0.007). Patients in the ketamine group had a lower mean RASS score post drug administration (-2.38 versus -0.62; p < 0.001). There was no statistically significant difference between the two groups concerning the use of additional sedating agents during transport (28.8% versus 27.9%; p = 0.913). However, upon arrival to ED, more patients in the ketamine group required additional sedating agents and airway supporting devices as compared to patients in the midazolam group (36.4% versus 17.6%; p = 0.015 and 46.2% versus 14.7%; p < 0.001 respectively). There were also more reported adverse events in the ketamine group (9.1% versus 0%; p = 0.011).

Conclusion: The study found that there was no significant difference in endotracheal intubation rates between IM ketamine and IM midazolam.
ABSTRACT

Survey of Emergency Physician Performed Compartment Pressures Measurements for Acute Compartment Syndrome

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Background and Objectives: Background: Emergency physicians (EPs) are expected to recognize and diagnose acute compartment syndrome (ACS). Measurement of compartment pressure is considered an integral procedure in the practice of emergency medicine, and EPs are therefore expected to recognize and diagnose acute compartment syndrome (ACS). ACS is rare, but a delayed or missed diagnosis can lead to morbidity, mortality, and medico-legal action. Literature is sparse on the current state of EM training and practice of measuring compartment pressures, but anecdotally physicians receive variable training and feel uncomfortable with this skill. This study aimed to determine the setting, extent, and comfort of practicing EPs in performing compartment measurements for ACS.

Methods: Methods: This was a prospective study that surveyed a convenience sample of practicing United States EPs (including resident physicians). An electronic survey, that would take less than 5 minutes to complete, was created on the Redcap platform and we attempted to capture as broad a sample as possible by distributing the survey via the Council of Residency Directors in Emergency Medicine survey listserv, American College of Emergency Physicians listserv, and the Emergency Medicine Doctors Facebook website.

Results: Results: A total of 340 surveys were completed. Most (58.5%) respondents worked in an academic center, and 62.6% reported receiving training in compartment syndrome measurement. Over half of physicians (55%) did not feel confident in accurately measuring compartment pressure and 49.5% did not feel confident in placing the needle in the compartment. Thirty-six percent of attendings with > 6 years of practice did feel confident/very confident in needle placement compared to 15% of residents and attendings with < 5 years of practice.

Conclusion: Conclusions: This survey is an attempt to gather data on the current state of training on compartment syndrome measurement. Almost 1/3 of respondents did not report formal residency training and about half are not confident in accurately placing the needle or measuring the pressure. We feel there is an opportunity for future education in teaching this procedure during residency. Limitations include low response rate, recall bias, the potential for duplicate responses by respondents who are on multiple social media platforms, and EPs that may not be represented on the social media platforms we used.
ABSTRACT

Appropriate ordering of coagulation studies in the ED

Sara Blomstrom, Hynes Birmingham

Background and Objectives: Coagulation studies in the ED at UCONN Health center are often ordered when clinically unnecessary. This is in part out of habit as part of a blood panel with little value added to the patient. The inappropriate coagulation testing results not only in unnecessary financial costs but also potentially undesirable outcomes for patients (hemolysis and redrawing of blood). Making sure that nurses and providers are purposefully ordering these tests may lead to a significant reduction in cost and resource utilization without any decrease in the quality of care provided to the patient. 

Objectives: Decrease amount of inappropriate ordering of coagulation studies through education and systems changes.

Methods: Education was held in lecture with power point form for both nurses, PA’s and physicians in the ED. Badge pamphlets were handed out and posters were placed in the area where physicians chart and order studies for reminders of appropriate ordering of these tests. Ordersets were changed to remove PT/INR/PTT from abdominal pain, chest pain and general weakness. This was both on the nursing and physician side (at the time of implementation there was a paper order form that needed to be filled out to reflect the EMR order form and sometimes prior to implementation, coags would get checked off on the physical form without a physician order). Blue top tubes were placed in a separate drawer than the remainder of the typical blood tubes obtained. With the help of the lab we were able to monitor the actual amount of coagulation testing done on a monthly basis to compare pre and post intervention data.

Results: The coagulation ordering rate decreased from the average of 26.8% pre-intervention to the average of 10% post intervention. This coincides with over a 62% reduction in coagulation studies ordering. This resulted in a savings of $250,000 in the 10 months post intervention. Patients continued to get excellent care.

Conclusion: Using education and implementing a clinical change in the ordering of unnecessary coagulation studies resulted in a dramatic reduction of studies ordered, leading to a savings of $250,000 in a 10 month period. This saves patients and the hospital both time and money while continuing to provide excellent care.
ABSTRACT

Effectiveness of Simulation Case Guides for Preclinical Medical Students

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Background and Objectives: Simulation allows students to learn in a safe, controlled environment with no risk of harm to patients. Learning objectives are then reinforced through debriefing. Emphasis has been placed on early exposure to clinical simulation in medical education. The goal of this study was to develop instructional guides for clinical simulation cases which are suitable for preclinical medical students, and to assess the effectiveness of those curricular materials through evaluation of the participants.

Methods: Instructional guides were developed for two simulated cases with a chief complaint of chest pain: myocardial infarction (MI), and pulmonary embolism (PE). Participants were recruited from first and second year classes at the University of Connecticut School of Medicine. They completed a multiple choice pre-test with questions related to the chief complaint. Students participated in the simulation in teams of 3-5 using a high fidelity manikin (Sim Man 3G, Laerdal). The cases were run and debriefed by emergency medicine residents or faculty using the guides, then participants completed a post-test which was identical to the pre-test for that case. Debriefing physicians were blinded to the tests so their briefing would not be tailored to test questions. Pre and post-test scores were compared using a paired t-test.

Results: Sixteen first and second-year medical students participated in the study; six in the MI case and ten in the PE case. In aggregate, post-test scores increased by a mean difference of 20% (p=0.018; 95%CI 3.96–36.04). When data was broken into subgroups by case, the mean difference for the MI case was 50% (p=0.038; 95%CI 3.04–70.29) and the mean difference for the PE case did not reach statistical significance (p=0.244; 95%CI -8.16 to 28.16).

Conclusion: Mean post-test scores improved for both cases, although only the MI case reached statistical significance on its own. Participants performed much worse on the PE test overall (both pre and post-test) than the MI test. This could indicate that the test was too difficult or not focused on topics which came up during the case or debriefing. Future research should be done with this case after correcting the test content or bolstering the guidelines for debriefing. Based on the results for the MI case, that instructional guide is suitable for continued use in undergraduate medical education.
ABSTRACT

Employing Risk Stratification to Decrease CT Pulmonary Angiogram Usage for Pulmonary Embolism Diagnosis

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Background and Objectives: Pulmonary embolism (PE) is a mechanical obstruction of the pulmonary vasculature that produces nonspecific signs and symptoms, such as chest pain and dyspnea. Physicians can use validated clinical decision algorithms (i.e. Wells criteria, PERC rule) and a D-dimer test to determine a patient’s risk for PE. A retrospective chart review analyzing 247 charts from 7/1/15-6/30/16 in a single Emergency Department showed that 13.77% of CT pulmonary angiograms (CTPAs) were positive for PE, falling below the 15-18% positive rate seen in other studies. This study will reassess CTPA ordering over six months after provider education and implementation of a mandatory decision tool.

Methods: A mandatory decision tool was implemented in the electronic medical record when ordering a CTPA in the Emergency Department. Providers could choose from four options: pretest high clinical suspicion, Wells score >4, low risk patient with positive D-dimer, or other. Providers were educated on risk stratification protocols and their prior ordering rates. A retrospective chart review was then performed on patients who received a CTPA for suspected PE at a single Emergency Department from 4/1/19-10/1/19. Data was collected on the ordering physician, selection in the mandatory decision tool and CTPA result. Frequency tables were created to determine the percent of positive CTPAs and provider selections in the decision tool.

Results: 235 CTPAs were included in the analysis. 42 cases (17.87%) where CTPA was performed were positive for PE. 42.86% of the patients with PE had a CTPA ordered due to “pretest high clinical suspicion” and 38.1% were “low risk patients with positive D-dimer.” The most common reasons for ordering a CTPA were “pretest high clinical suspicion” (43.4%) and “low risk patient with positive D-dimer” (32.3%).

Conclusion: This data shows that implementation of a mandatory decision tool in the electronic medical record and provider education led to improved usage of risk stratification by providers at this Emergency Department. This change resulted in an increase in the percent of positive CTPAs for PE from 13.77% to 17.87%. Future steps are to provide physicians feedback on their ordering rates and evaluate another six months of data.
ABSTRACT

Evaluation of Time to Administration of Prothrombin Complex Concentrate Following Implementation of A Dosing Pilot

Cassandra Doyno - University of Connecticut, Jessica Lomanno

Background and Objectives: Implementation of a prothrombin complex concentrate (PCC) administration protocol has improved rates of time to administration. In May of 2018, our institution implemented a PCC dosing protocol that improved pharmacy workflow and medication delivery, further allowing for a pilot of bedside reconstitution for reversal of anticoagulation. The objective of this study is to evaluate time to administration (TTA) of PCC following implementation of such workflow.

Methods: This is a single center retrospective study including adult patients in the emergency department (ED) who received 4-factor PCC for reversal of anticoagulation. Data was collected for 67 patients prior and 42 patients post-pilot. The primary outcome was TTA. Secondary outcomes included serious adverse events and mortality on admission. A subgroup analysis including patients requiring reversal for VKA-induced hemorrhage only was additionally conducted. Student t-test was utilized for time to administration analysis and chi-squared tests were utilized for all categorical data analysis, using Microsoft® Excel software.

Results: A total of 203 patients received PCC at our between November 2016 and May 2018. 94 patients were excluded, as they did not receive PCC in the ED, or if electronic documentation error occurred. 109 total patients were analyzed. 21 patients per arm were required to have 80% power reduction in time, assuming a two-tailed t-test with alpha of 0.05. The TTA was significantly reduced by 10 minutes (35 to 25 minutes; p=0.003). Thrombotic events occurred in 8 patients pre-pilot and 2 patients post (12 vs.5%; p= 0.21). Bleeding occurred in 22 patients pre-pilot and 9 patients post (32 vs.21%; p=0.20). Mortality during admission occurred in 16 patients pre-pilot and 5 patients post-pilot (24 vs. 12%; p=0.12). Time to administration in a subgroup was still significantly reduced (35 to 26 minutes; p=0.01). Subgroup analysis of secondary endpoints in VKA patients showed reduction of thrombotic (13 vs. 0%; p=0.03) and bleeding events (34 vs.12%; p=0.032).

Conclusion: Our institution significantly reduced time to administration of a live-saving reversal agent and did not result in any additional harm. This evaluation led to internal quality improvement and further discussion on potential of further dosing alternatives with respect to 4-factor PCC.
ABSTRACT

Frequency of Multiple Opioid Overdoses per Individual in Connecticut During Seven Month Period

Peter Canning - University of Connecticut, Katherine Hart - Connecticut Poison Control Center, Suzanne Doyon - University of Connecticut, Richard Kamin - UConn Health, Mary Kosciusko - University of Connecticut

Background and Objectives: Opioid overdoses kill 130 Americans every day and cost the nation $179 billion a year in health and public safety costs, lost wages and productivity. Citing the high costs of providing care to opioid overdose victims, recently an Ohio town considered prohibiting emergency responders from administering naloxone to people who have overdosed multiple times. Using a statewide data base of EMS reported opioid overdoses, we examined the number of patients who overdosed multiple times during a seven-month period to determine how frequently multiple overdose in the same person occurred in Connecticut.

Methods: The Connecticut Statewide Opioid Reporting Directive (SWORD) requires emergency responders to report opioid overdoses to the Connecticut Poison Control Center (CPCC). Using name and date of birth, we retrospectively examined the period between June 1, 2019 and December 31, 2019 to determine the number of patients who had a reported overdose, and the number who had multiple overdoses.

Results: During the seven-month period, there were 2,909 reported opioid overdoses involving 2,536 persons. Two-hundred-eighty-three persons (11.16%) were recorded as overdosing multiple times. Two-hundred-twenty-six (8.91%) overdosed twice. Thirty-seven (1.46%) overdosed three times, eleven (0.43%) overdosed four times, six (0.24%) overdosed five times, two (0.08%) overdosed six times and one person (0.04%) overdosed 7 times. The data does not include patients who overdosed and EMS failed to report the case and those cases when a patient overdosed and 911 was not called. It also does not take into account any overdoses that occurred before or after the study period.

Conclusion: Most people who overdosed on opioids during this seven-month period had only one reported overdose. The assumption that opioid users overdose repeatedly appears false. Clarifying this stigmatizing inaccuracy is important in understanding opioid overdose and directing resources towards addressing it.
ABSTRACT

Hurricane Dorian Disaster Response

Natalie Moore - University of Connecticut, Robert Fuller - 18507

Background and Objectives: Hurricane Dorian, a powerful category 5 hurricane that hit the Northwest Bahamas on September 1st, 2019, left devastating effects exacerbated by its slow-moving speed, which caused prolonged rainfall and extreme damage to these islands. Not only were many people missing and displaced from their homes, but there was significant infrastructure damage to homes, schools, health care facilities and roads, leading to unsafe conditions in terms of shelter, nutrition, transportation, power and phone lines.

As members of the International Medical Corps Emergency Response Team, our team was among the first non-governmental organizations to respond to the health needs of the Abaco Island and Grand Bahamas community.

Methods: Upon deployment, our initial response to Hurricane Dorian included the following: communicating with/taking direction from the Ministry of Health in the Bahamas; establishing a partnership with the Rand Memorial Hospital for setting up a field clinic; performing a needs assessment in the greater community; collaborating with the community and other aid organizations via the Cluster Method; and giving medical care alongside local care providers.

Results: Communication with local caregivers and officials, coupled with our needs-assessment evaluation, led to the building of a field clinic with mobile medical units serving the 60-mile eastern stretch of the Grand Bahamas. The majority of cases seen and treated in the first week of the response included administration of tetanus vaccine, refilling of home medications, and treatment of hypertension, mental health complaints and minor injuries and infections.

Conclusion: Deployment of the International Medical Corps team resulted in a successful response, which included a collaborative effort to assess community needs which lead to the construction of a field clinic in eastern Grand Bahamas.
ABSTRACT

Impact of Just-In-Time Emergency Department Simulation Training on Medical Student Procedural Performance


Background and Objectives: The progressive utilization of mannequin- and model-based simulation in medical education has greatly expanded opportunities for training future physicians. These modalities have special utility in the teaching of procedural skills where there is a risk of harm to patients. Recent studies have combined simulation with a just-in-time (JIT) training approach in order to assess the efficacy of simulated practice of a procedure immediately prior to its performance in patient care. In these studies, JIT training has demonstrated promising results in improving resident and faculty performance.

Methods: This study was a prospective randomized trial that employed a self-directed simulation-based JIT training module in two emergency departments (ED). It aimed to assess whether JIT training improved procedural performance among medical students. The bespoke module incorporated videos, images, and written instructions that fourth-year medical students followed while performing a practice suturing procedure on a high-fidelity model. Students undertaking their emergency medicine rotation were randomized to this intervention, which they were asked to complete immediately prior to performing their first suture on a patient in the ED. Students’ suturing performance was assessed by attending physicians using validated tools. All participants completed a self-assessment. A total of 18 students were evaluated, nine in the treatment group and nine in the control group.

Results: Students who were randomized to the module rated their suturing performance more highly (3.78/5.00 vs. 3.33/5.00, p=0.28), were observed to complete more steps on 21-point suturing checklist (19.22/21 vs. 16.22/21, p=0.07), and scored higher on a compound score of physician assessment of their technique (28.22/35 vs. 26.4/35, p=0.47. Attending physician assessment of the students overall suturing performance on a Likert scale did not differ between treatment and control group.

Conclusion: The implementation of a JIT suturing training module was associated with improved self-perception of procedural performance among medical students and improved assessments of technique by attending physicians, though neither of these effects was statistically significant.
ABSTRACT

Incidence of Opioid Overdoses in Motor Vehicles in Connecticut

Peter Canning - University of Connecticut, Suzanne Doyon - University of Connecticut, Katherine Hart - Connecticut Poison Control Center, Richard Kamin - UConn Health, Mary Kosciusko - University of Connecticut

Background and Objectives: In 2017, over 70,000 Americans died from overdose, including 1,038 in Connecticut. Knowing where patients are overdosing can help public health groups target interventions. This study examines how many suspected opioid overdoses occur in motor vehicles using data from the Connecticut Statewide Opioid Response Directive (SWORD) project.

Methods: The SWORD project requires emergency medical system (EMS) providers to report all suspected opioid overdoses to the Connecticut Poison Control Center (CPCC) in real time. Data are collected prospectively for each case. A pre-determined series of ten questions are systematically answered for each case. One question is: “Did the overdose occur in a motor vehicle?” This question was introduced into the questionnaire on July 15, 2019. We retrospectively examined answers to this question for the period of July 15, 2019 to December 25, 2019 (5 months). Each record where motor vehicle was checked was matched with the CPCC record, which was reviewed for accuracy and additional information. We recorded if the motor vehicle was moving or parked at the time of the overdose, if there was a collision (MVC) and/or injuries, and if naloxone was given and by which type of responder.

Results: A total of 2,078 suspected overdoses were reported to the CPCC during the study period of 5 months. Of these 2078 suspected overdoses, 210 (10.1%) occurred in a motor vehicle. Of the 210 suspected overdoses that occurred in a motor vehicle, 106 (50.4%) involved a motor vehicle that was moving or engaged in “drive”; 104 (49.6%) involved stationary motor vehicles with 17 (8.0%) in cars parked at gas stations. Forty-one (19.5%) involved MVCs with four associated with severe injuries. Naloxone was administered to 176 patients (83.8%). Police first administered naloxone in forty (22.7%) cases.

Conclusion: Up to 10.1% of suspected opioid overdoses occur in motor vehicles. Approximately half of these suspected overdoses occur in moving vehicles and 20% involve MVCs. Police officers who respond to the scene of a motor vehicle collision should be equipped with naloxone. Harm reduction groups may want to consider making naloxone available to gas station attendants in high-risk areas.
ABSTRACT

Reliability of Intravenous Infusion Rate Monitor and Flow Control Devices in Simulated Prehospital Environment

Nicholas Frederico - University of Connecticut School of Medicine, Cailyn Regan - University of Pittsburg, Steven Bordonaro - University of Connecticut, Richard Kamin - UConn Health

Background and Objectives: Gravity-fed IV infusion systems may deviate from their intended flow rate over time, which can potentially affect patient safety. Infusion pumps are the gold standard for setting a constant flow rate, but their use is limited in prehospital medicine due to cost. In the absence of an infusion pump, adjuncts to gravity-fed IV systems may allow for better control of volume infused. The goal of this study is to determine the reliability of the DripAssist infusion rate monitor (Shift Labs, Seattle, WA) and the Stat2 IV gravity flow control device (Conmed, Utica, NY) compared with a gravity-fed IV set alone in a simulated prehospital environment.

Methods: Normal saline was run through gravity-fed IV systems in three groups: gravity-fed alone (control), Stat2, and DripAssist. We conducted 34 trials both at rest and in a moving ambulance to achieve 80% power to detect a medium effect size. Each system was set to 120 mL per hour for 30 minutes, with adjustments made as needed every 10 minutes. The outcome measure was the total amount of fluid delivered over each trial. We compared measurements using analysis of variance (ANOVA) for all setups. Each moving setup was also compared to its respective static setup using unpaired t-testing.

Results: ANOVA revealed a statistically significant difference between groups for both the static and moving trials (static F(2,99)=17.42; p<0.001; and moving F(2,99)=6.4542; p=0.0023). For both settings, post-hoc testing by Tukey HSD revealed significant differences between DripAssist and control (static Q=7.229; p<0.01; moving Q=4.5424; p<0.01); and between Stat2 and control (static Q=7.229; p<0.01; moving Q=4.2426; p<0.01); but there was no significant difference between Stat2 and DripAssist in either setting (static Q=0.000; p=0.899; moving Q=0.2995; p=0.899). There was no significant difference in t-tests between any moving setup and its corresponding static setup.

Conclusion: Our data suggest that both DripAssist and Stat2 were more accurate at achieving the targeted IV infusion rate than gravity-fed IV sets alone in both the static and prehospital setting. We did not find a significant difference between Stat2 and DripAssist in either setting. Although there was statistical significance, this may not translate to clinical significance unless the systems were running over many hours or the medication being delivered called for a highly precise dose.
ABSTRACT

Translating Discharge Instructions into Spanish and Haitian Creole: Human Translator vs. Google Translate


Background and Objectives: Hospitals are required to accommodate patients with limited English proficiency, but little research exists regarding written materials. In the absence of evidence-based guidance, some emergency physicians resort to tools such as Google Translate when writing discharge instructions (DCIs). The study hypothesis was that if DCIs are translated from English to Spanish or Haitian Creole using human translators (HT) versus Google Translate (GT), the HT DCIs will (1) contain fewer errors and (2) be preferable to native speakers.

Methods: 211 discharge instructions were extracted from consecutive patient encounters at our primary clinical site in June 2018. The free text portion of the DCIs were translated by blinded physicians who are native speakers or certified translators of either Spanish or Creole.

In Part 1 of the study, two Spanish-speaking and one Creole-speaking physicians (all native speakers) who were not involved in data collection or HT reviewed the original DCIs in English and counted the number of errors in the HT and GT translations.

In Part 2, the reviewers selected which translation, HT versus GT, they preferred based on the accuracy and readability of the translations.

Results: In Part 1, the Spanish GT DCIs had more errors than HT (634 and 399 for GT versus 299 and 284 for HT). This difference was not statistically significant due to insufficient interrater reliability (k=0.47). Creole GT DCIs had more errors than HT (1720 for GT and 490 for HT). In Part 2, the Spanish reviewers preferred HT (82.0% and 77.9%); the Creole reviewer preferred the HT (93.3%). With regards to Spanish GT, the reviewers noted that the GT errors could cause problems ranging from missed appointments to sentinel events such as drug overdose that were not present in the HT DCIs. With regards to Creole, GT was unable to translate basic medical terms such as “primary care doctor” and “sutures,” making these translations nonsensical.

Conclusion: While the error categorization did not reach statistical significance, the data trend shows that the HT DCIs had fewer errors than GT, supporting the hypothesis. Furthermore, the HT DCIs were preferred by reviewers for both languages. The critical finding in this study is that GT may provide either unintelligible or potentially harmful translations. Consequently, clinicians should remain vigilant regarding the potential risks of tools such as GT.
INNOVATION

Don't Read Your Article to the Group: A New Paradigm for Residency Journal Club

Seth Lotterman; Cynthia Price; Shawn London

Intro/Background: The traditional journal club (JC) format is often credited to Sir William Osler’s literature reading group at McGill University in 1875. In its most recent incarnation in our residency, JC had become a rote performance involving a great deal of summary with some methodological criticism which was associated with a low degree of resident and faculty satisfaction and poor contribution to resident learning.

Purpose/Objective: Our objective was to modernize this educational component of our program by increasing resident engagement and to change JC to a more interactive and engaging presentation format.

Methods: JC presentations are now organized so the block PGY-3 teaching resident poses a clinical question related to the residency block curriculum theme and 2-3 articles which address different possible answers to this question. PGY-1 residents present background on the topics and research methodology in the presented articles. Presenting senior residents take a pro/con position based on the article they are assigned and may bolster their argument with additional supporting literature.

Outcomes (if available): In the past six months of JC evaluations obtained by the program since the change in format occurred, 66% of the residents prefer the new debate-type format compared to the traditional journal club format.

Summary: Traditional JC formats involving residents summarizing an article and discussing statistics can be dry and boring. In modifying the JC format, we have increased intern participation and hopefully increased their knowledge of statistics or the background science behind a study. Having senior residents take a position on the topics requires them to have a more nuanced knowledge of the literature than just summarizing the papers. Overall, a significant majority of the residents prefer the new format for this activity. Areas for future study and application include potentially extending this format to the medical student emergency medicine interest group meetings.
INTRODUCTION

EPIC Point-of-Care Ultrasound Workflow Solution

Michael Joseph; Meghan Herbst; Robert Fuller

Intro/Background: Point-of-Care Ultrasound (PoCUS), when performed correctly, has consistently been shown to improve patient safety, time to diagnosis, clinical management, resource utilization, and patient satisfaction. A robust ultrasound workflow allows for quality assurance (QA), credentialing, billing, and transparent integration with the electronic medical record. With increasing PoCUS use, it is critical to attain an effective and efficient workflow to achieve continued education, deliver the best possible patient care, and sustain program growth.

Purpose/Objective: To work with EPIC Radiant consultants and our departments of Radiology and Information Technology to create an ultrasound workflow through EPIC, without utilizing a third-party vendor, that promotes uninterrupted performance, seamless documentation, storage in our hospital picture archiving and communication system (PACS), integrated billing, and a transparent QA process.

Methods: A single PoCUS order was created; when selected, patient information is sent to the ultrasound device and to a queue in the Ultrasound Director’s EPIC in-basket for QA. Smartforms were created to reflect expected PoCUS documentation that answers binary questions pertinent to each application. These smartforms are hidden unless selected by the performing provider. Acquired images route to our hospital PACS wirelessly from the ultrasound device and link to EPIC documentation.

Outcomes (if available): When documenting a PoCUS exam, the provider selects a credentialing status. All credentialed providers indicate whether they will bill for the exam, and billing codes are embedded in the procedure documentation. The ultrasound director reviews all scans for image quality and interpretation accuracy, adding an attestation statement to the note upon review. True positives, true negatives, false positives, and false negatives are tracked on an EPIC dashboard according to provider and exam.

Summary: Our novel workflow described here formalizes the incorporation of educational and diagnostic PoCUS into clinical care. Credentialed attendings can bill for the studies they have performed as part of their clinical care and avoid unnecessary confirmatory imaging. However, the patient is not billed when PoCUS is performed by noncredentialed providers (including residents). Consultants may see the images and documentation, including whether the ultrasound was reviewed by a credentialed provider. Residents, who need to perform hundreds of PoCUS exams to graduate but are inherently uncredentialed in PoCUS as learners, may document their findings with a clear indication of their resident status. The QA attestation stating the acceptability of the study images and the accuracy of the interpretation is added to the EPIC note when reviewed by a credentialed provider. This note helps consultants and primary care providers better understand what transpired when patients communicate they “had an ultrasound”. Continued learning and credentialing occur through the QA process, which also takes place within EPIC.

This workflow has been live for 5 months, during which 958 PoCUS examinations were performed with interpretations on 756 patients. Among the examinations, 3% were aorta, 1% appendicitis, 15% biliary, 6% bladder, 20% cardiac, 1% deep vein thrombosis, 5% focused assessment with sonography in trauma, 2% musculoskeletal, 9% pelvic, 2% ocular, 19% renal, 1% scrotal, 9% soft tissue, 4% thoracic, and 3% were PoCUS-guided procedures. Two new attendings were credentialed in two PoCUS applications in the first 3 months of its operation. An online training module was distributed to all faculty and residents to complete before using the workflow, with compliance being close to 100%. Twenty-eight of 54 residents have rotated through our department since our workflow went live, and all have used the workflow correctly.
INNOVATION

Incorporating Butterfly iQ devices into UME and GME curricula

Kaitlin Lipner; Sandra Carpenter; Morgan McCarthy; Meghan Herbst; Brian Wong

Intro/Background: Handheld ultrasound units are smaller and more affordable when compared to cart-based point-of-care ultrasound (PoCUS) equipment. Approximately 40 Butterfly iQ devices can be purchased for a similar cost as a single cart-based ultrasound machine. The University of Connecticut was one of the first institutions to purchase these for undergraduate medical education (UME) and graduate medical education (GME) use.

Purpose/Objective: To date there are limited publications on the value of incorporating these portable units across UME and GME curricula. We aimed to incorporate the use of Butterfly iQ technology into both UME and GME ultrasound education, observing the advantages and disadvantages of these devices in the learning environment.

Methods: Forty and twelve Butterfly iQ ultrasound units were purchased for UME and GME use, respectively, in the fall of 2018. The UME units are secured and maintained in the simulation center. Two ultrasound faculty familiar to medical students incorporate the units into the curriculum and also approve requests from faculty or students to use the units for other educational purposes. The GME units are secured and maintained by the Emergency Medicine residency coordinator.

Outcomes (if available): Students use the units in courses spanning all years of medical school, from pre-clinical anatomy and physical diagnosis skill acquisition, to clinical-based courses including a fourth year transition to residency course. Residents use the units independently in the clinical setting for educational purposes, saving pertinent clips and interpretations, but excluding identifying information. The ultrasound director reviews all scans for image quality and interpretation accuracy, providing personalized feedback in a secure cloud environment.

Summary: The Butterfly iQ units allow for more effective learning groups, incorporation of scanning sessions into didactics, even in learning environments with limited physical space, and asynchronous education. They have led to new UME curricula, including pairing ultrasound with newly acquired physical examination skills, required third year hands-on ultrasound sessions based on clinical vignettes, and an ultrasound elective where a single faculty member can teach up to 16 students, each equipped with a Butterfly iQ device. The units have facilitated incorporation of near-peer education, coupling an instructor (experienced student, resident, or attending) with 2-3 medical students to keep group sizes small. The large number of ultrasound units will allow for formal observed assessments of fourth year students’ ultrasound skills. Students and faculty have also used units for interest group meetings, independent ultrasound practice, and simulation sessions. A disadvantage at the UME level is the lack of knobology and traditional transducer morphology due to the simplicity of the Butterfly iQ, which may affect a student’s understanding of basic ultrasound physics. Advantages at the level of GME include the portability (residents focused on learning ultrasound can carry these units in their pockets and avoid searching for a cart-based machine with each PoCUS opportunity), and increased access to PoCUS in hospital patient care areas that previously did not have ultrasound available. Also, the Butterfly cloud was customized so that residents each have their own folder. Residents appreciate receiving timely feedback on all exams, as well as the easy access to images for educational purposes. A disadvantage to Butterfly iQ use across a large group of users is that its compatibility is limited to Apple products. While most students who have compatible devices are evenly distributed among learning groups (so all groups have access), not every individual student can use their personal device.
INNOVATION

Near-peer 4-year ultrasound curriculum

Katie Rong; Grace Lee; Meghan Herbst

Intro/Background: Near-peer education has been shown to increase confidence and satisfaction from the instructor and learner perspective. Ultrasound incorporation into undergraduate medical education (UME) is essential but many medical schools have limited faculty and resources. Aligning resident resources from graduate medical education (GME) with UME can make this incorporation feasible. Emergency medicine (EM) residents are natural ultrasound teachers given their work with a diverse patient population, interactions across medical specialties, and consistent day-to-day ultrasound use. Purpose/Objective: To incorporate near peer ultrasound education into a 4-year UME curriculum, utilizing the more experienced fourth year medical students as well as the 54 EM residents at the University of Connecticut (UConn) to assist the two UME ultrasound faculty, and observing the feasibility, advantages, and potential disadvantages of this strategy. Methods: UConn EM residents receive intensive ultrasound training, starting with a two-day ultrasound course during their residency orientation and maintaining a strong ultrasound presence throughout their three-year residency. They, as well as fourth year UConn medical students who have demonstrated proficiency in ultrasound, are asked on a volunteer basis to participate in various components of the UME ultrasound curriculum, equipped with faculty guides, the option of a pre-training session, and intermittent faculty supervision across curricular sessions. Outcomes (if available): Medical students benefit from near peer teaching throughout their 4-year UME curriculum: 1st and 2nd year students identify sonoanatomy of organ systems and correlate with gross anatomy and other imaging modalities; 2nd year students learn to incorporate ultrasound into the physical examination; 3rd year students perform ocular, thoracic, shoulder, cardiac, and abdominal ultrasound applications according to a clinical vignette; and 4th year students perform ultrasound-guided vascular access and participate in ultrasound objective structured clinical examinations. Summary: Utilizing near-peer teaching strategies has allowed UConn to incorporate an effective ultrasound curriculum to all medical students (over 400) throughout their 4-year medical school experience, despite limited ultrasound faculty. Specifically, near-peer teaching has reduced the medical student-to-instructor ratio to as small as 2:1 (increasing hands-on experience, supervision, and feedback per student), increased resident involvement in medical student education (strengthening the UME-GME alignment), increased resident and student confidence in teaching and performing point-of-care ultrasound, increased opportunity to explore teaching roles among students and residents interested in pursuing academic careers, informed ultrasound faculty about the teaching ability of residents and students, and improved feedback to students and residents on how to teach more effectively.

Disadvantages of incorporating this strategy include variability of ultrasound and/or teaching experience across instructors, potentially resulting in uneven effectiveness across groups. In the next year we plan to study the effectiveness of near-peer teaching compared to that of ultrasound faculty teaching, using a written assessment and objective structured clinical examination to assess medical student ultrasound knowledge. We anticipate scores across both groups will be similar, demonstrating that near-peer teaching is not only well received but also as effective as teaching by ultrasound faculty. To date, this would be the largest study in the United States on the effectiveness of near-peer ultrasound teaching.
ABSTRACT

“If You Don’t Need Opiates, You Don’t Need EMS”: Evaluating Perceptions of Prehospital Pain Management

Andrew Kamilaris, Jeffrey Brady, Laurel O’Connor - University of Massachusetts, Julianne Dugas - Boston Medical Center, Ricky Kue - Boston Medical Center, John Broach - University of Massachusetts

Background and Objectives: Practice patterns involving the use of opiate and non-opiate analgesics are under scrutiny. The association between the use of opiates in the prehospital setting and misuse is unclear, but it is a common venue for the initiation of opioid therapy and the decision to utilize opiates is made by non-physicians. Although non-opiates are an option for many prehospital services, there is little literature describing providers’ perceptions of pain management.

Methods: A survey was administered to nationally registered paramedics recruited from sixteen prehospital agencies one year after the introduction of ketorolac, ibuprofen and acetaminophen to state protocols. Previously, only fentanyl and morphine were utilized. This anonymous survey utilized binary questions and Likert scales to determine perceptions of this cohort of paramedics regarding prehospital analgesia and the use of non-opiate medications.

Results: In total 100 subjects were surveyed (mean age 41.98 years, 95% CI 40.19-43.76, 84% male). 85 paramedics reported planning to use non-opiates and 35 reported having done so. Subjects who reported planning to utilize non-opiates were significantly younger (38.91 years old) and less experienced (11.15 years of experience) than those who did not (41.4 years old, p<0.00001; 15 years of experience, p=0.012, respectively). Concerns about drug seeking behavior and opiate tolerance were not different between these groups. Subjects indicated that concern about adverse effects, efficacy, and time to effect impacted their decision to administer non-opiates. They supported the use of ketamine for analgesia and opposed implementation of more structured protocols for selecting prehospital analgesics.

Conclusion: Subjects were keen to administer non-opiate medications although few had done so. Younger, less experienced paramedics were more likely to plan to administer non-opiate analgesics. This pattern may be related to unfamiliarity with non-opiate medications or cultural resistance to change. Beliefs about non-opioid analgesics pertaining to adverse effects, onset time, and efficacy may influence their adoption into practice. Additional education on the indications and suitability of non-opiates in the prehospital setting may facilitate their appropriate use and avoid excessive opiate medication administration while permitting prehospital providers to practice independently.
ABSTRACT

A Multicenter Analysis of CT Cervical Spine Overutilization

Karl Chamberlin, Kevin Kotkowski

Background and Objectives: Multiple clinical decision tools have been developed and validated to assist with cervical spine imaging in patients who present to the emergency department for traumatic injuries, most notably the NEXUS criteria and the Canadian C-spine Rule. Despite the availability of these tools, CT imaging of the cervical spine is often performed unnecessarily on patients who are low risk for a clinically significant injury by risk stratification. The purpose of this study is to quantify the rate of overutilization of CT C-spine and identify the key factors that contribute to overutilization.

Methods: Data were obtained on all patients who underwent CT of the cervical spine at a tertiary care academic emergency department and three affiliated community hospital emergency departments in January 2019. Chart review was performed to identify whether each patient met any NEXUS criteria. Data were collected on the academic status of the emergency department where the CT was performed (academic versus non-academic). Data were also collected on other hypothesized contributing factors including age, sex, race, time of arrival, ESI level, trauma activation level, mechanism of injury, anticoagulation status, disposition from the ED, and experience level of the ordering provider. The academic status of the emergency department was analyzed using chi square analysis, while the remaining variables were analyzed with descriptive statistics.

Results: A total of 405 patients underwent CT of the cervical spine during the study period. Of these patients, 172 (42.5%) were negative by NEXUS criteria. The non-academic emergency departments had a significantly higher rate of overutilization of CT C-spine in comparison to the academic emergency department (57.5% versus 35.1%; p = 0.008). Ten of the 405 patients were found to have cervical spine fractures on CT, one of whom was NEXUS negative but had a clinically insignificant fracture.

Conclusion: Nearly half of all patients who underwent CT of the cervical spine in the ED after a traumatic injury were negative by NEXUS criteria. This finding is more pronounced at non-academic emergency departments, suggesting a potential avenue to reduce unnecessary patient radiation and optimize the use of ED resources.
ABSTRACT

A new image rating scale for cardiac ultrasound in cardiac-arrest. A description of internal validity

Andrew Kamilaris, Romolo Gaspari - University of Massachusetts Medical Center, Timothy Gleeson - University of Massachusetts Medical Center, Justin Harvey - UMASS Memorial Medical Center, Christopher DiCroce - University of Massachusetts Medical School, Ari Nalbandian - University of Massachusetts, Michael Hill - University of Massachusetts Medical Center, Robert Lindsay - University of Massachusetts Medical Center, Alexandra Nordberg - UMASS Memorial Medical Center, Felipe Teran-Merino

Background and Objectives: Ultrasound (US) in cardiac arrest involves obtaining views of the heart in 10 seconds or less during pauses in CPR. This technique is dramatically different from cardiac US in other patient populations that can take 30 min or more. The object of this study was to create and evaluate an image rating scale for US in cardiac arrest.

Methods: A modified Delphi technique was used to create an image rating scale through iterative improvements in the image-rating tool by experts in limited US. The tool was then used to rate a series of US from patients in cardiac arrest. Agreement between two blinded reviewers was assessed using unique cohorts of patients in cardiac arrest. Agreement was assessed using Cohen’s Kappa with weighted averages. US images were obtained upon arrival to the emergency department and digitally recorded. Recorded US images were rated for image quality, the presence of cardiac activity, and the presence of organized cardiac acuity. US Images were rated by individuals blinded to clinical and sonographer variables.

Results: Image quality ratings from poor to excellent were 1-unable to interpret, 2-sufficient to detect only if the heart is beating, 3-sufficient to determine the quality of cardiac activity, 4-sufficient to visualize internal details of heart (inner myometrium, valves...), 5-sufficient for quantitative analysis. The image quality agreement for all US was good with a weighted kappa of 0.65 (0.42-57). There was no difference in agreement for US with cardiac activity compared to those with cardiac standstill. Over a 13-month period a total of 146 patients were consecutively enrolled following out-of-hospital cardiac arrest. 237 US were performed, 49% subxyphoid (SX) and 51% parasternal long (PSL). Agreement for SX images was greater than PSL images (0.65 to 0.52). Cardiac activity ranged from none (33%) to disorganized activity (18%) to organized activity (49%). (0.50 to 0.53). Agreement was great for presence or absence of “cardiac activity” and “organized cardiac activity” with a kappa of 0.84 and 0.78 respectively.

Conclusion: A new image rating scale for limited cardiac US during cardiac arrest demonstrates internal validity with good agreement between reviewers. This tool will help integrate US into cardiac arrest by better describing the type of cardiac US used in resuscitation.
ABSTRACT

ADMIT US: Actionable Dengue Management Initiated in Triage with Ultrasound

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Background and Objectives: Ultrasound (US) findings in dengue fever can include gallbladder wall thickening and presence of fluid in the pleural and peritoneal spaces. Our objective was to determine if these findings could be detected in children at presentation to the hospital and predict disease severity/progression in a resource-limited setting.

Methods: A single-blinded, prospective, observational study of consecutive patients with suspected dengue who presented during a dengue outbreak. WHO dengue classification criteria were used. Children 3 months through 16 years were eligible. Patients with severe dengue were excluded. Subjects were identified at triage and RUQ, FAST, and lung ultrasound exams were performed by investigators. Treating physicians were blinded to ultrasound results. Follow-up was conducted 7-10 days after enrollment by blinded hospital staff via telephone and medical record review. Disease severity/progression was defined as need for hospital admission. Data was analyzed using descriptive statistics and Fisher’s exact test.

Results: 252 subjects were enrolled. This represented 8.0% of children who presented for evaluation of a non-critical acute illness during the study period. Average age was 7.5 years and 54% of subjects were male. Of subjects with sonographic findings, ascites (71.9%) and gallbladder wall thickening (54.7%) were most prevalent. Pleural effusion and bilateral pulmonary b-lines were discovered in only one patient each, respectively. US findings were present in 48.6% of subjects who required admission at initial presentation versus 12.5% of discharged subjects (p < 0.0001). Of subjects discharged who required a subsequent unplanned admission, 38.2% had US findings. Follow-up was achieved for 87.3% of subjects. Differences between successful and lost follow-up groups such as admission rates, US findings, or dengue warning signs were not significant (p values = 0.3, 0.7, 0.6 respectively).

Conclusion: US findings in suspected, non-severe dengue are associated with need for hospitalization and may help guide management in resource-limited settings. Ascites and gallbladder wall-thickening were the most common findings.
ABSTRACT

Analysis of a Quality Improvement Project for Atrial Fibrillation in the Emergency Department

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Background and Objectives: Atrial Fibrillation (AF) is a common, abnormal heart rhythm associated with adverse outcomes. Emergency Department (ED) management is highly variable and lack of a standardized approach negatively impacts overall quality and efficiency of care. Moreover, there is some evidence that AF quality improvement programs can positively impact care in the ED. Our goal was to implement a quality improvement project and study its' impact on clinical outcomes, specifically hospital admission rates, for ED patients with AF.

Methods: We performed a before and after study at a tertiary care institution with an EM training program between 12/2017 and 7/2019. Our intervention was implemented on 9/2018 and included clinical decision support (CDS) embedded in the electronic health record, ED provider education, and email reminders. Data collected during 9/2018 was considered washout and not used. Patients were included if they presented to the ED with AF as the principal problem. Our primary outcome, obtained by structured chart review, was hospital admission rates of AF patients treated before and after implementation. Secondary outcomes included ED length of stay (LOS) and rates of attempted cardioversion. Data were analyzed with t-tests or chi-square as appropriate.

Results: The study sample consisted of 363 patients with 171 and 166 patients comprising our pre- and post-implementation groups, respectively. For all patients presenting with AF, admission rates decreased from 53.6%±11.9% to 37.4%±10.4% (p=0.003) and LOS decreased from 37.9±10.9 hours to 32.2±12.1 hours (p=0.13) following implementation. Hospital admission trends decreased most significantly in the months immediately following the intervention, and then began to up-trend towards pre-implementation rates. A secondary outcome included rates of attempted ED cardioversion, which increased from 16.3% to 21.2% (p=0.38).

Conclusion: Implementation of a simple education and CDS program led to decreased admission rates and trends toward a decreased ED LOS and increased rate of ED cardioversion attempts. The generalizability of our results are limited by our single center design, and small sample size. Future research includes optimizing our intervention through provider feedback and doing additional analyses of secondary outcomes related to quality measures and patient-centered care.
ABSTRACT

Barriers Transitioning from ED to Community: Initial Findings from Suboxone Bridge Clinic

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Background and Objectives: The national opioid epidemic remains the leading cause of overdose (OD) deaths in the United States with upwards of 70,000 deaths reported in 2017. In 2018, the Massachusetts Health Policy Commission awarded University of Massachusetts Memorial Medical Center (UMMMC) $750,000 to implement a Bridge Clinic that connects Emergency Department (ED) patients suffering from Opiate Use Disorder (OUD) with outpatient services during a 21-month trial period.

Methods: Patients presenting to two UMMMC ED locations were screened through the electronic health record and chart reviews were conducted on all patients to determine eligibility for Bridge Clinic services. Patients engaged in motivational interviewing by behavioral health workers (BHW) to educate, enhance engagement and connect with services. Eligible patients were offered Suboxone induction in the ED or within intervening days at the Bridging Clinic. Bridging services also included ongoing recovery coaching, counseling, care coordination, continuation of Suboxone and treatment of co-morbid psychiatric conditions.

Results: As of September 2019, 360 patients screened as at-risk for OUD and 59% (211) as Bridge Clinic eligible. A total of 40 (19%) eligible patients were referred for Bridging services. ED staff and BHW referred 20% in the ED and 80% via telephonic follow-up. Suboxone was initiated in the ED for 75% (30) of referred patients and 25% (10) initiated Suboxone post ED visit. 53% (21) engaged with the Bridge Clinic or a community partner and 45% (18) remained in treatment at 30 days. Of this group, 17% (3) of patients had a non-lethal OD. Of the 19 patients not engaged in treatment at 30 days, 65% (11) had a non-lethal OD. At 60 days, 72% (13) remained engaged in treatment with no OD, and 36% (7) patient who were not engaged at 30 days, began engaging at 60 days--two of which had a non-lethal overdose within 30 days of initial ED visit. Neither group had a lethal OD.

Conclusion: Patients who received telephonic follow-up, opposed to direct referral during ED visit, consistently failed to engage in treatment. Those who engaged in bridging treatment for 30 days were likely to remain in treatment at 60 days, and those who remained engaged at 30 days experienced .2468 (RR) [95% CI .0809 to .7530; P = 0.014] times the risk of non-lethal overdose than those who do not engage in treatment within 30 days of initial ED visit.
ABSTRACT

Basic Cardiac Ultrasound is not the same as Echocardiography, Impact on Cardiac Arrest. A REASON study

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Background and Objectives: Echocardiography involves multiple ultrasound (US) images of the heart and takes minutes to complete. Limited Cardiac US in cardiac arrest involves obtaining the best single image in as short a time as possible to prevent delay of CPR. The object of this study was to evaluate the image acquisition time and image quality in brief limited cardiac US.

Methods: Multi-center randomized, interventional study. IRB approved. Non-cardiac arrest patients were randomized to sub-xiphoid (SX) or parasternal (PSL) as the initial attempt. Physicians recorded a 4 second clip of the best cardiac US image possible in the shortest period of time. Alternative image (PSL vs SX) was obtained as a second independent attempt. Start and stop time was defined as when US started and when the transducer was removed from the skin. Image quality was rated in a blind fashion using a validated image quality scale by research staff. The subset of US under 10 sec was compared to all other attempts. Data recorded into a REDCap database included US length, image quality rating, physician experience.

Results: 19 sites enrolled 177 physicians who performed 1757 cardiac US on 1693 unique patients. Average time of image acquisition was 6.8 s and average image quality was 3.5 out of 5. Most US (95.5%) were of sufficient quality to determine if the heart was beating, and 84.1% was of sufficient quality to determine if the heart was twitching or had organized cardiac activity. There was no difference in image acquisition time comparing SX (6.7s) and PSL (6.9s). Physicians with >200 US experience were more likely to obtain images in under 10 s (60.2% of time) compared to less experience (50.3% of time), p<0.0001. Patient age, gender and BMI did not affect US timing <10 s.

Conclusion: Brief limited cardiac US as would be performed post cardiac arrest has sufficient image quality to guide resuscitation. Imaging approach (PSL vs SX) did not impact overall image acquisition time.
ABSTRACT

Characteristics of Brief Limited Cardiac Ultrasound, Implications on Resuscitation, a Multicenter REASON Study

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Background and Objectives: Brief Cardiac Ultrasound (US) in resuscitation requires a technique that is different from standard echocardiography. It involves obtaining a single cardiac view as quickly as possible in unstable patients. The object of this study was to evaluate patient and physician elements that impact timing of image acquisition for brief cardiac US.

Methods: Single blind, multi-center randomized, observational study of physicians obtaining standardized US views of the heart. Physicians were asked to obtain the best cardiac US images possible in the shortest period of time. Patients not in cardiac arrest were imaged using a standardized protocol randomized to sub-xiphoid (SX) or parasternal (PSL) view of the heart. Start and stop times were defined as when the physician was told to start imaging, and when the transducer left the patient’s skin. 4-second digital clips were recorded. Data recorded into a central REDCap database included time, image rating, physician experience, US variables and patient variables. Analysis included Student’s T-test, Fisher’s Exact.

Results: The majority of physicians (52.2%) obtained a single cardiac US in 10s, 73.6% by 15s and 84.3% by 20s. Imaging acquisition took an average of 13.9s (95%CI 13.3-14.5) overall. 21 hospitals enrolled 1998 unique physician-patient interactions with 3994 US. Physician US experience averaged 220 cardiac US, and 17.9% of physicians with 25-50 prior US. There was no difference in image acquisition times for SX vs PSL. Patient age and gender had no effect on timing. Image acquisition time decreased as US experience increased, 25-49US (17.1s), 50-99US (15.0s), 100-199US (11.5s), 200-399 (10.7s) and >400US (11.1s). Increasing BMI was associated with longer times, p<0.0001.

Conclusion: The majority of clinicians can obtain a single cardiac image in 10s or less. Brief limited cardiac US, as needed during CPR, can be challenging to perform in the time period advocated post arrest. More experienced clinicians required less time to acquire images. The most experienced clinician should perform bedside US on unstable patients.
ABSTRACT

Development of a Research Communication Device Using 3D Printing and Open Source Software and Microprocessors

Robert Lindsay - University of Massachusetts Medical Center, Ari Nalbandian - University of Massachusetts, Justin Harvey - UMASS Memorial Medical Center, Michael Hill - University of Massachusetts Medical Center, Christopher DiCroce - University of Massachusetts Medical School, Timothy Gleeson - University of Massachusetts Medical Center, Romolo Gaspari - University of Massachusetts Medical Center

Background and Objectives: Enrolling patients in clinical studies requires identification of eligible subjects and communication with research staff for consent in a timely fashion. The lack of easy communication between clinical staff the Emergency Department (ED) and research staff can be a barrier to enrollment. The objective was to design and build a device that ED staff could use to quickly and easily alert research staff when patients eligible for a research studies present.

Methods: Using available open source microprocessors from Arduino™ and single-board computers from Raspberry Pi™ along with the open source messaging application Telegram™ we designed and tested multiple devices to easily and rapidly alert research members of the arrival of possible study participants. To create a housing for our physical device we designed prototypes using the free online software Tinkercad™. We trialed 3D printing using both the online service makexyz™ and a free to use MakerBot Replicator™ 3D printer at a public library.

Results: We developed a custom device that met all our requirements. The device has a single button and two LED indicators. It is powered by a standard USB cable. When a staff member activates the device by pushing the button the pre-determined research members are alerted via open source messaging software Telegram™ immediately. Research staff can turn on or off notifications at any time from their personal cellphone. There is no limit to the number of staff who can be alerted. This was done at a low cost and required no expert consultation. Our final product can be easily reproduced for future projects at a cost of around $50 USD.

Conclusion: A notification system for clinical research to facilitate study enrollment can be built at a low cost with no expert consultation. This system can be re-purposed for future research using free online software and easily obtainable materials.
ABSTRACT

Does Video Instruction Improve Emergency Medicine Residents’ Competency in Performing Cricothyrotomy?

Allison Beaulieu - University of Massachusetts, Viral Patel - University of Massachusetts

Background and Objectives: Cricothyrotomy is a rare, but lifesaving procedure which all Emergency Medicine physicians must be able to perform during critical airway events. Traditionally, procedural training in residency has been taught utilizing written instruction; however, with access to free open access media (FOAM), there has been an increase in the number of videos available to learn procedural skills. The purpose of this study was to compare the efficacy of written vs video instruction of cricothyrotomy technique in a cohort of emergency medicine resident trainees.

Methods: Emergency Medicine residents at an academic medical center were randomized to either read a textbook chapter or watch a video on cricothyrotomy. Residents with prior clinical cricothyrotomy experience were excluded. All enrolled residents performed a cricothyrotomy on a simulation model. Primary outcomes included time to completion and number of mistakes which were recorded by a blinded surveyor. Secondary outcomes, rated on a Likert scale, included comfort level and preparation level. Outcomes were compared by paired t-test.

Results: Of the 31 of residents enrolled, 27 met inclusion criteria, 15 received video instruction and 12 received written instruction. Both comfort level of cricothyrotomy and average time to completion were significantly better for video instruction compared to written instruction (p = 0.03, p = 0.04). Level of preparation and number of mistakes was not significant between groups. Post-graduate year did not influence results.

Conclusion: Video instruction improved the time to completion and resident level of comfort when compared to written instruction for residents performing a cricothyrotomy on a simulation model. With limited time and resources for rare procedural training during residency, video instruction from FOAM prior to procedural training may help improve resident competency.
ABSTRACT

ED-SAFE 2: Improving Suicide Prevention through Continuous Quality Improvement

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Background and Objectives: To evaluate the impact of using a continuous quality improvement (CQI) model to improve suicide-related care for adults in the emergency department (ED) setting.

Methods: Eight geographically diverse EDs used a common CQI approach called Lean to identify suicide-related care gaps and implement improvements, including, at minimum, improving screening quality and implementing personalized safety planning. Each ED progressed through three 12-month phases: Baseline (Control), Implementation (suicide-related care was improved using Lean), and Maintenance (care was further improved and sustained using Lean). A random sample of patients screening positive for suicide risk presenting during each phase was selected and followed for six months to ascertain acute healthcare related to suicidal ideation, suicidal attempts, or death by suicide. The data were analyzed using interrupted time series analysis and generalized estimating equations (GEE), fitting suicide-related acute healthcare in the six months after the index visit (Yes/No) as the dependent variable with independent variables including time as month for each phase separately, site step, and a time indicator for the original and the new phase.

Results: 3,005 subjects screened positive for suicide risk and were discharged: (1) Baseline (n=1,052), (2) Implementation (n=1,038), and (3) Maintenance (n=915). For subjects presenting during Baseline, there was no significant month-to-month change in 6-month suicide-related acute healthcare (p=0.47). For subjects presenting after the CQI efforts began (Implementation), 6-month suicide-related acute healthcare decreased when compared to those presenting during Baseline (p<0.001), with a significant decrease in the month-to-month trend in outcomes during Implementation (p=0.001). During Maintenance, the decreasing month-to-month trend in outcomes continued (p=0.004), although this trend was not large enough to lead to overall decrease in suicide-related acute healthcare between Implementation and Maintenance (p=0.54).

Conclusion: Implementing a CQI approach (Lean) to improve suicide-related care corresponded to decreased risk for experiencing suicide-related acute healthcare episodes in the 6-months after an index ED visit. Future analyses will examine the role of specific care improvements, such as safety planning.
ABSTRACT

High prevalence of Clostridioides difficile in nursing home elders and its relationship with medication exposures

Protiva Dutta, Evan Bradley, Amanda Higgins - University of Massachusetts Medical School, Doyle Ward, Beth McCormick, John Haran

Background and Objectives: Nursing home (NH) residents are a susceptible group to Clostridioides difficile (C. diff) infections due to high prevalence of colonization and frequent exposures to antibiotics. Elders living in the NH are exposed to multiple medications, which may also increase the risk of C. diff colonization. Our objective was to describe the C. diff colonization patterns and explore the associations with antibiotic and other medication exposures among NH residents.

Methods: We conducted a prospective longitudinal cohort study of elders 65 years or older from 5 NH sites collecting stool samples monthly for 4 consecutive months. Elder demographics, medications, and previous exposures were extracted through the NH medical record. None of these elders had diarrhea during or for 4 months after the study period. Detection of C. diff in the stool was done by real-time polymerase-chain reaction for the tcdA and tcdB toxin genes. Descriptive statistics were applied, chi square test of independence, t test and odds ratio were used to interpret significance of results. We used multivariate ordinal logistic regression to assess predictors of being colonized once or multiple times with C. diff, adjusted for the contributions of other variables.

Results: Of the 87 elders, 51 (58.6%) had at least one sample positive for C. diff while 21 (24.1%) had multiple longitudinally positive samples. Elders with antibiotic exposure within the past 6 months were over 6 times more likely to have multiple colonization timepoints (OR 6.43; 95%CI 1.36,30.40). In our ordinal logistic analysis, after adjusting for age, gender, medical comorbidities, antibiotic and medication exposures, elders with antibiotic exposure (OR 7.20; 95%CI 1.99,26.08) and on a factor Xa inhibitor (OR 6.08; 95%CI 1.15,31.92) both had increased risk of colonization and then multiple colonization however proton pump inhibitors had a decreased risk (OR 0.09; 95%CI 0.02,0.35).

Conclusion: Colonization with C. diff in the NH is common with over half of the residents have C. diff detected in their stool and one quarter of these residents exhibiting colonization over multiple time points. A recent history of antibiotic exposure increases the risk of colonization, however, proton pump inhibitor use reduces this risk. Adjusting these medication exposures may be one way to combat the high colonization prevalence among NH elders.
How Will Disaster Victims React to First Responder Commands - Survey of Simulated Disaster Victims

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Background and Objectives: Triage is an integral part of a disaster response and is one of the earliest interventions during a Mass Casualty Incident (MCI). Triage systems are structured whereas triage at a real MCI can be chaotic in practice. Most triage algorithms depend significantly upon victim participation and acceptance of triage decisions. We hypothesized that in an MCI, victim interaction with triage personnel would not conform in many cases to expected actions as dictated by the Simple Triage and Rapid Treatment (START) triage methodology.

Methods: In total 105 volunteer victims were recruited for an active shooter MCI drill from a variety of sources including community groups. Victim actors were assigned injury patterns and moulaged to simulate injuries. The actors then portrayed their injuries as responders participated in a variety of scenarios related to triage. An anonymous 32-question survey was distributed after these exercises. Survey questions specifically related to how subjects imagined that they would interact with triage teams in a real MCI based on their experience.

Results: The survey response rate was 90% (95/105). Half of all respondents indicated that they would ask responders to change their triage color if they disagreed with it. Twenty one percent of victims reported that they would alter their own triage tag to receive treatment faster and 38% reported that they would alter a family member’s triage color. There was a significant difference among age groups for those who would change their family member’s color with the youngest and oldest groups more likely to act maladaptively (43% and 56%) compared to the 20-39 year cohort (18%) (p = .009).

Conclusion: Triage algorithms such as START rely to a large extent upon victims and bystanders following the instructions of rescuers. Our study suggests that maladaptive behavior by some victims should be anticipated when planning for MCI response. This study is limited by its small sample size but indicates that further research is needed on this topic.
ABSTRACT

Ketamine and Etomidate Induced Medication Assisted Intubation Have Equal Success Rates in Prehospital MAI

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Background and Objectives: The use of ketamine as an induction agent in Medication Assisted Intubation (MAI) is enjoying increased interest in the prehospital setting. It is desirable for its favorable hemodynamic profile, bronchodilatory effect, and ability to provide analgesia and sedation without inducing apnea. In some prehospital protocols, it is replacing traditional agents such as etomidate, although it must be used with some caution in certain populations. The objective of this study was to compare MAI success rates by choice of induction agent in the prehospital setting.

Methods: A single-center retrospective chart review was conducted of all intubations attempted by an urban hospital-based paramedic service with MAI capabilities in 2018. Demographic data were collected as well as outcome measures including endotracheal intubation success rates for each induction agent. Chi square testing and two-tailed T tests were utilized to determine statistical significance.

Results: In total, 407 patients underwent attempted intubation; 390 were successful (mean age 58, 71% male). Patient characteristics between the ketamine, and etomidate cohort were not significantly different with regards to age (p = 0.440), gender (p= 0.228), weight (p=0.624) or the presence of cardiac arrest (p=0.916). For all MAI attempts, Succinylcholine was utilized as a paralytic. There were 38 attempts made using etomidate with 95% success and 132 attempts made using ketamine with 98% success. There was no significant difference in success rates between these two cohorts (P= 0.320). Additionally, there was no difference between overall success rates for intubation attempts without medication or either induction agent (p= 0.193 for ketamine and 0.958 for etomidate).

Conclusion: In an urban prehospital paramedic service, the use of etomidate and ketamine as induction agents for MAI were associated with equal success rates. Additional study is required to determine if hospital outcomes are different for patient who received each induction agent. Both agents have desirable qualities and adverse effect profiles that render them appropriate for certain patient populations. It may be prudent to maintain the availability of both given their comparable performance in the prehospital setting and to continue to educate paramedics on the optimal choice for each patient encounter that necessitates MAI.
ABSTRACT


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Background and Objectives: Ultrasound (US) in cardiac arrest occurs during 10-second pauses in CPR and uses image acquisition techniques different from standard echocardiography. The object of this study was to evaluate the image quality of brief cardiac US.

Methods: Single blind, multi-center randomized, interventional study of physicians obtaining standardized US views of the heart. Physicians of varying experience obtained cardiac US images on consenting non-cardiac arrest patients with the instruction to obtain the best images possible in the shortest period of time. Subxiphoid (SX) and parasternal long (PSL) views were obtained on each patient with the first imaging technique determined by randomization. Image quality was rated from 1(poor) to 5(excellent) using a validated image quality scale. Image quality rating included image quality sufficient to detect only if the heart is beating (rating of 2) and sufficient to determine the quality of cardiac activity (rating of 3). Physician US experience level was recorded. Data was analyzed using Student’s T test, Fischer’s exact.

Results: 21 sites enrolled 202 physicians who performed 4022 US on unique patients. 93.7% of all patients had enough image quality to determine if there was cardiac activity or not (score >2). 82.2% of patients had image quality sufficient to determine the quality of cardiac activity (score >3). PSL image quality (3.8) was greater than SX (3.5), p<0.0001. SX image quality, but not PSL, was lower in obese patients (BMI>30) compared to non-obese patients (3.0 vs 3.5, p<0.0001). Image quality increased as physician experience increased; 25-49US (3.5), 50-99US (3.5), 100-199US (3.6), 200-399 (3.8) and >400US (4.0).

Conclusion: It can be challenging to obtain quality images during brief cardiac US during CPR pauses, but the majority of brief cardiac US had sufficient image quality to be useful in cardiac arrest. Increasing physician US experience was associated with improved image quality. Patient BMI impacted image quality in SX but not PSL views.
ABSTRACT

Multidrug resistant pathogen colonization in nursing home residents and associations with medication exposures

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Background and Objectives:Nursing homes (NH) have been identified as a critical link in the transmission of multidrug resistant pathogens across healthcare networks. The acronym ESKAPE includes 6 pathogens that exhibit multidrug resistance, virulence, and high morbidity: Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp. Predictors of intestinal colonization of ESKAPE pathogens are not clearly understood. Our objective was to investigate the relationship between medications, age, and intestinal bacterial colonization among residents in NH facilities.

Methods:We conducted a prospective longitudinal cohort study of 121 elders 65 years or older from 5 NH sites collecting stool samples monthly for 4 consecutive months. Elder demographics, medications, and previous exposure were extracted from NH medical records. Metagenomic sequencing was used to detect the presence of ESKAPE pathogens in stool. To interpret significance of results we used descriptive statistics, chi square test of independence, and t test and odds ratio. To assess the predictors of being colonized one or more times with ESKAPE pathogens, we used multivariate ordinal logistic regression that allowed adjustment for the contribution of multiple variables.

Results:Of the 121 elders, 77 (63.6%) had at least one sample positive for one of the ESKAPE pathogens with K. pneumoniae (64), P. aeruginosa (19), and Enterobacter (16) being the most prevalent. Of the 77 ESKAPE positive elders 43 (55.8%) had multiple positive samples longitudinally. Elders with antibiotic exposure within the past 6 months were 3 times more likely to have colonization detected at multiple timepoints (OR 3.28; 95%CI 1.31,8.24). In our ordinal logistic analysis, after adjusting for age, gender, medical comorbidities, and hospital exposure, elders with antibiotic exposure (OR 3.24; 95%CI 1.09,9.60) and on a proton pump inhibitor (OR 2.93; 95%CI 1.19,7.22) both had a 3 times increased risk of colonization and multiple colonization. Also, for every 10 years in age the colonization risk went up by 83% (OR 1.84; 95%CI 1.16,2.90).

Conclusion:Intestinal colonization of ESKAPE pathogens is associated with advanced age as well as proton pump inhibitor and antibiotic exposures. Reducing these exposures may be one way to combat the spread of these pathogens.
ABSTRACT

Nobody wants to be Narcan’d: A qualitative analysis of drug users’ perspectives on bystander naloxone

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Background and Objectives: Efforts to increase naloxone availability figure prominently in public health strategies to decrease opioid overdose deaths. While there is ample evidence supporting the effectiveness of bystander naloxone distribution programs, the effects of increasing naloxone availability on people who use drugs (PWUD) have not been adequately delineated. This pilot study seeks to 1) evaluate whether individuals’ drug use patterns and attitudes have changed as a result of proliferation of naloxone distribution programs and 2) explore individuals’ knowledge of, access to, experiences with, and perceptions of naloxone. We hypothesize PWUD have familiarity with and accept naloxone use, and do not increase their drug use in the presence of naloxone.

Methods: We piloted a semi-structured interview developed by the National Drug Early Warning Systems workgroup with participants presenting to a large, tertiary care academic emergency department with a history of non-medical opioid use. Thematic analysis was used to code and analyze transcripts from the semi-structured interviews.

Results: Ten participants completed the study. All participants were aware of naloxone by brand name (Narcan®) and were trained in its use, and all but one possessed a naloxone kit. None of the participants reported an increase in their drug use when naloxone was present. Barriers to naloxone administration included fear of legal repercussions, not having it readily available, and a desire to avoid interrupting another user’s “high.” Seven out of ten participants reported having previously received naloxone at least once. All participants who had received naloxone described an intensely unpleasant physical response consistent with severe opioid withdrawal.

Conclusion: Participants were accepting of, knowledgeable about, and willing to administer naloxone. We discovered that participants did not increase their use of opioids when naloxone was available. Instead, they reported a tendency to use opioids more cautiously due to fears of precipitated withdrawal from receipt of naloxone.
ABSTRACT

Nursing Initiated X-Rays and Troponins from Triage Lead to Significantly Shortened Room-to-Dispo Times in EDs

Tanya Girgenrath

Background and Objectives: Emergency Department (ED) crowding is a challenge facing hospitals across the country, often leading to extended wait times and subsequently protracted length of stays. Given the impact of these metrics on patient care, safety, and satisfaction, it is essential for us to research methods to improve flow through the ED, starting in the waiting room. This approach is especially salient in large, urban hospital settings that are regularly operating at or over capacity and thus often have ED wait times exceeding several hours. Implementing nursing-initiated orders from triage is one strategy to improve patient flow that requires further investigation. This study aims to demonstrate the effect of ordering specific laboratory and imaging studies from triage on median room-to-disposition time for ED patients.

Methods: In December 2018, a new protocol for RN initiated orders was established in one large, urban academic center ED. Data was then collected between December 2019 and October 2019 regarding median room-to-disposition time for patients with orders placed by the RN in triage. In this study, we focus specifically on comparing the median room-to-disposition times of patients with x-rays or troponin levels ordered from the waiting room versus room orders.

Results: The median room-to-disposition time for the 1,258 patients who arrived in the emergency department by the front door and had an x-ray done in the waiting room was 54 minutes shorter (201 minutes versus 147 minutes) when compared to the 16,435 patients who had x-rays ordered once they had been roomed. The median room-to-disposition time for the 970 patients who arrived in the emergency department by the front door and had a troponin level drawn in the waiting room was 67 minutes shorter (248 minutes versus 181 minutes) when compared to the 7,877 patients who had troponin levels ordered once they had been roomed.

Conclusion: The median room-to-disposition time for patients receiving x-rays and troponin levels from triage was significantly shorter than similar patients who did not. This approach may be best suited to EDs with long wait times, and warrants further investigation in additional settings. Additionally, it would be useful to research what percentage of testing ordered from triage could be considered unnecessary.
ABSTRACT

Prolonged Hospital Stay for Low Risk Acute Heart Failure Patients

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Background and Objectives: Previous studies have stratified a low risk acute heart failure (AHF) population appropriate for observation unit (OU) care based on data available at time of ED presentation. However, further prediction of and preparation for low risk patients’ clinical course variations is needed, especially for those arriving at hospitals without dedicated OUs and who go on to have prolonged inpatient length of stays (LOS) beyond the US median 3.4 days (81.6 hours). The purpose of this study is to identify medical and social variables adversely correlated with early discharge in order to further stratify low risk AHF patients and for designing robust post-discharge support structures.

Methods: We reviewed ED and inpatient charts of patients 65 years and older previously enrolled in a prospective AHF study at an academic medical center between 2011 and 2014 prior to the implementation of an OU. We identified a low risk cohort based on Society of Chest Pain Centers recommendations, describe this group’s incidence among all AHF ward admissions, and create a case series exploring themes in prolonged admitted LOS beyond the national AHF median.

Results: Of 178 patient visits initially admitted to a ward unit with an ED diagnosis of AHF, 66 (38.2%) were low risk. The median age was 80 years. Median ED LOS was 7.6 hours and inpatient LOS was 67.9 hours (IQR: 35.4, 94.8). Three patients (4.4%) later went to a step down or intensive care unit, all for non-AHF complications. Two patients died within 30 days of discharge from non-cardiac causes. Twenty-three (34.8%) patient visits had admitted LOS > 81.6 hours. In univariate analysis, patients with a long admitted LOS were more likely to get echocardiograms, have ED troponin I values between 0.05 and 0.12, as well as be discharged to rehabilitation or skilled nursing. More than 70% of our low risk cohort was admitted on supplemental oxygen and this was not correlated with prolonged LOS.

Conclusion: Published recommendations identifying low risk AHF patients may not adequately predict their inpatient LOS at institutions without OUs, although they may identify patients at low risk for serious short term cardiac complications. Further stratifying this acute low risk population at ED presentation in terms of their clinical recovery needs may be helpful in determining when ongoing recuperation can be safely transitioned to a non-inpatient setting.
ABSTRACT

Providers reasoning behind ordering a urinalysis in elderly patients: a target for antimicrobial stewardship

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Background and Objectives: Although urinalysis (UA) with reflex to culture provides rapid diagnostics for urinary tract infections (UTIs) in elderly patients, it is too frequently relied upon in the Emergency Department (ED) and poses adverse health effects via inappropriate antimicrobial therapy in elders with asymptomatic bacteremia (ASB). Our objective was to investigate the ordering patterns among ED providers for UA with culture reflex to determine whether or not these ordering practices pose increased risk to elderly patients in the ED.

Methods: We assessed factors associated with ordering a UA with reflex to culture among providers from 4 sites at the University of Massachusetts Memorial Medical System. Our survey consisted of 3 patient vignettes involving: 1) an elderly patient with generalized weakness as the only symptom; 2) same patient with a history of dementia; and 3) same patient with new onset confusion. Response options were on a Likert scale from “0” being very unlikely to “5” being very likely to order a UA. We also asked short answer questions with the goal of identifying the clinical reasoning for ordering UA. Descriptive statistics were used for data analysis.

Results: Of the 112 providers, 91 (81.3%) responded to the survey. For each of the 3 vignettes, providers identified the importance of ordering a UA with culture reflex higher than the likelihood that an UTI was causing the patient’s symptoms with the following means and standard deviation (SD): case 1, 2.35 (1.67) vs. 1.61 (1.13); case 2, 2.78 (1.67) vs. 1.96 (1.29); and case 3, 3.29 (1.49) vs. 2.55 (1.19). Half of the providers reported that they would order an UA for general weakness as the only symptom and 12% would routinely order an UA for an elderly patient presenting with a mechanical fall.

Conclusion: Since roughly about 20% of elderly women and 10% of elderly men have ASB, unnecessary ordering of UAs leads to the over diagnosis of UTIs and unnecessary use of antimicrobial treatments. Providers weigh the perception of the need to order UAs higher than the utility of the information gained during a patient’s workup, and as a result this presents a target for antimicrobial stewardship efforts. Additionally, the practice of routinely ordering UAs for presenting complaints not possibly related to UTIs provide ample foci to improve the care and reduce the cost of treating elderly patients in the ED.
Statewide Pain Management Practice Patterns after the Introduction of Non-opiate Analgesics

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Background and Objectives: Literature suggests that non-opiate analgesics are comparable to opiates with regards to patient satisfaction and safety for many common complaints. Undifferentiated patients, discomfort with new medications, and lack of structured clinical guidelines complicate management of prehospital pain. Additional study is needed to determine how non-opiate medications are being integrated into practice.

Methods: This study employed a pre/post intervention retrospective chart review model. Data for opiate and non-opiate administrations from the State Ambulance Trip Information System between January 1st 2017 and December 31st 2018. Ketorolac, ibuprofen and acetaminophen were introduced to the protocols on January 1, 2018; previously only morphine and fentanyl were available. The rate of opiate and non-opiate utilizations after this introduction were recorded as well as subjects’ age, gender, initial heart rate (HR), systolic blood pressure (SBP), location, and clinical impressions.

Results: There were 385 fewer opiate administrations for pain complaints in 2018 than 2017. The proportion of opiates administered per individual EMS service ranged from 0.39 to 1.0 and 120/223 services utilized non-opiates in 2018. Women were less likely to receive an opiate medication than men (OR=0.78, 95% CI 0.6877-0.8867) and trauma patients were more likely to receive opiate medications than non-trauma patients (OR=2.36, CI 1.96-2.84). Transport times were significantly longer in opiate administration events (mean 36.97 minutes) than non-opiate administration events (29.35 minutes) (t=17.34, p<0.0001). Differences in initial SBP and HR between opiate and non-opiate administration events were statistically but not clinically significant (-1.93 mm Hg and 1.81 bpm, respectively). There was no significant association between median income and proportion of opiates administered.

Conclusion: The introduction of non-opiate pain medication to state protocols led to reduced opiate administration over one-year. Men, trauma patients, and patients with longer transport times were more likely to receive opiate pain medications; no other captured demographics were predictive. The modest use of non-opiate medications may be related to providers’ unfamiliarity with new medications or concern about adverse effects. Additional education may be warranted to encourage their utilization when appropriate.
ABSTRACT

The effect of brief cardiac ultrasound on CPR pauses. Balancing speed and image quality.

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Background and Objectives: Ultrasound (US) during cardiac arrest can extend CPR pauses. We evaluated the effect of targeted US education on duration of CPR pauses with the goal of decreasing pause length during cardiac arrest resuscitation. We also assessed the effect of decreasing imaging acquisition time on US image quality.

Methods: IRB-approved, single blind, prospective, interventional trial in out-of-hospital cardiac arrest. Consecutive patients enrolled over 13 months. Physicians underwent didactic training emphasizing pre-imaging the heart during active CPR prior to pausing CPR. Patients underwent a single view cardiac US during CPR pauses. Duration of pause was obtained through review of video recordings of the resuscitation. Data included pre-hospital interventions, patient characteristics, and resuscitation variables. US image quality was rated using a validated image quality scale from 1 to 4 with two blinded reviewers and adjudication. Data was analyzed comparing pre- to post-education using Student’s T-test, ANOVA, and Fisher Exact.

Results: CPR pauses decreased post-education (28.8 to 13 seconds, p<0.0001). Over 13-months, 58 providers performed 235 US on 146 of the 169 patients presenting in cardiac arrest. There was no difference pre- and post-education regarding the patient or US variables, or clinical outcomes, except for length of CPR (14:32 vs 16:42, p<0.0001). Patients with a mechanical compression device had longer pauses when imaged using subxyphoid (SX) vs parasternal (PSL) 21.1 vs 15.9 seconds, p=0.037. Non-US interventions such as issues with LUCAS device, airway, or IV access were associated with longer CPR pauses compared to pauses with US. Cardiac US image quality was not different pre- or post-education (3.0 vs 2.8, p=ns) despite shorter acquisition times post-education. Image quality sufficient to detect cardiac activity (rating of 2), and organized cardiac activity (rating of 3) showed no difference pre- and post-education.

Conclusion: US education stressing pre-imaging during active CPR reduces the duration of CPR pauses during cardiac arrest without degrading US image quality. Choice of imaging approach (PSL vs SX) effects pause length in patients with mechanical compression devices.
ABSTRACT

Ultrasound Findings in Children with Suspected Dengue in Southeast Asia

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Background and Objectives: Dengue fever can lead to increased capillary permeability and plasma leakage. Manifestations of this phenomenon can be detected with ultrasound (US), including gallbladder wall thickening and the presence of fluid in the pleural and peritoneal spaces. Presence of pulmonary b-lines in dengue has not previously been reported. Our objective was to describe the prevalence of US findings in children at presentation to the hospital with suspected dengue.

Methods: A single-blinded, prospective, observational study of consecutive patients with suspected dengue who presented during a dengue outbreak in Siem Reap, Cambodia. Children 3 months through 16 years were screened for eligibility. Inclusion criteria included fever and suspected dengue per WHO criteria. Patients with severe dengue were excluded. Subjects underwent RUQ, FAST, and lung US exams performed by research staff using a Sonosite MicroMaxx machine and C60e/5-2 MHz transducer. Subjects initially admitted to the hospital or that returned for a repeat evaluation had follow-up US examinations. Technique for lung US included views at the midclavicular, anterior axillary, and posterior axillary lines. Data was analyzed using descriptive statistics.

Results: 252 subjects were enrolled. This study cohort represents 8.0% of children who presented for evaluation of a non-critical acute illness during the study period. Average age was 7.5 years and 54% of subjects were male. 25.4% of all subjects had an US finding. The most prevalent US findings were a positive FAST exam (71.9%) and gallbladder wall thickening (54.7%). Of the positive FAST exams, findings in the pelvis and Morison’s pouch were most common, 93% and 23.9%, respectively. LUQ findings or pleural effusion were only present in 6.5% of subjects each. Pericardial effusion and bilateral pulmonary b-lines were identified in only 1 patient each.

Conclusion: The most common US findings present in children with suspected dengue were ascites in the pelvis and Morison’s pouch. Gallbladder wall thickening was common and represents an uncommon US finding in non-dengue pediatric patients. Pericardial or pleural effusion and bilateral pulmonary b-lines were rare in children presenting with suspected dengue.
ABSTRACT

Usability and Impact of mHealth Interventions for Substance Use Disorder: A Systematic Review

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Background and Objectives: Substance use disorder (SUD) is highly prevalent among emergency department patients and has great potential for mobile health (mHealth) interventions. Connected interventions, or those that use data collected through mobile or wearable devices to trigger real-time interventions, are of particular interest. This review aims to describe the current landscape of connected interventions for SUD, their effect on clinical outcomes, and usability factors for these interventions.

Methods: A systematic review to identify studies evaluating connected health interventions for SUD was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Three databases (PubMed, IEEE, and Scopus) were systematically searched for relevant articles published over a five-year period (11/1/2013-11/1/2018). Included studies described a connected health intervention targeting SUD and provided data on one or more outcomes. Data were extracted using a standardized reporting tool by two authors, with a third author adjudicating. Study quality was assessed using either the National Heart Lung and Blood Institute’s Quality Assessment and the Critical Appraisal Skills Programme tools.

Results: A total of 1676 unique articles were identified during the initial search, with 32 articles included in the final analysis. The most commonly studied SUD was alcohol use disorder (AUD, N=20). The most common methodology used was a randomized controlled trial (N=13). Sixteen studies reported at least one statistically significant result with respect to reduced craving and/or substance use. Only two studies used a wearable device as part of the intervention. The majority of studies (N=30) used ecological momentary assessment (EMA) to trigger interventions, while four used biologic or physiologic data. Common intervention types included craving management, coping assistance, and tailored feedback. Twenty-three articles reported usability factors. Acceptability was generally reported as being high.

Conclusion: Identified themes among mHealth connected interventions included a focus on AUD, use of mobile phones, and use of EMA. The majority of studies reported positive effects and overall acceptability. Wearables that directly monitor biologic data represent an understudied opportunity for new original research.
INNOVATION

#Chiefing

Richard Church; Viral Patel

Intro/Background: The position of chief resident is a difficult one for a variety of reasons. In addition to the typical roles and responsibilities that are known to be inherent to the appointment, there are several facets that go unrecognized and, ultimately, miscommunicated or entirely excluded when the role is handed down. These areas in question are oftentimes noted as items that, if identified early, can lead to improved functionality in the post of chief resident.

Purpose/Objective: Identify common issues and situations chief residents encounter during the academic year and describe key learned aspects of the job that chief residents wished they had known prior to assuming the role.

Methods: Outgoing chiefs were surveyed regarding their prior experiences, including facets of the job that were found to be inaccurate, what they wished they knew prior to starting, and what they learned about themselves. Oncoming chiefs were surveyed regarding what they hoped to glean from outgoing chiefs, preconceived notions regarding responsibilities, and what they hoped to experience.

Results were developed into a list of deliverables to be disseminated to future chiefs at orientation.

Outcomes (if available): Several deliverables were identified as a result of this endeavor. These are listed in the summary below.

Summary: A variety of aspects surrounding improved functionality as a chief resident were identified. First of all, how to please everybody and manage issues with residents that are your friends is difficult. It is important to understand when to delineate your roll and commiserate with issues versus see real problems with co-residents and involve program leadership. Secondly, it is imperative to see how having good relationship with chief residents from other programs within your institution will make it easier to address problems and conflicts. Furthermore, understanding when to involve Medical Education Division leadership will aid in certain areas requiring conflict resolution. Lastly, one must recognize that several tasks will be performed and completed behind the scenes going completely unnoticed but, regardless, contributing to the overall functionality of the residency.
ABSTRACT

“Under house arrest”: qualitative study of patients’ and caregivers’ experiences after a fall-related ED visit

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Background and Objectives:Falls are a leading cause of injury-related emergency department (ED) visits among adults over age 65. Falls are a sentinel event for older adults, but their ED and post-fall experiences are understudied.

Methods:We conducted in-depth, qualitative interviews with patients and their caregivers who had an ED visit for a fall to better understand post-fall recovery, the skilled nursing facility (SNF) placement decision-making process, and the ease of obtaining outpatient follow-up. Using an interview guide, semi-structured interviews were audio-recorded, transcribed verbatim, coded and analyzed for a priori and emergent themes from the analytic framework and interview session note documentation, respectively.

Results:We completed twenty-two interviews within the six-month period after the initial ED visit (patient, n=14; caregivers, n=12). Patients were on average 83 years old, 9/14 were female, and 2/14 had cognitive impairment (CI). 6/12 caregivers were interviewed in reference to a patient with CI. We identified four overarching themes: 1) the fall served as a trigger for physical, psychological, and instrumental changes, 2) community engagement, direct caregiver support, and safety concerns were prominent factors frequently considered in the SNF placement decision-making process, 3) caregivers made accommodations to assist family members in continuing to live independently and 4) several barriers existed to short-term follow-up.

Conclusion:Older adults presenting to the ED after a fall report physical limitations and a prominent fear of falling after their injury. Caregivers play a vital role in securing the home environment, the SNF placement decision-making process, and navigating health-related appointments. The transition of care between the ED, SNF, and outpatient visits after a fall could be improved by anticipating challenges that occur after an injury and specifically putting resources in place to address isolation, changes in mobility, and fear of falling.
ABSTRACT

A novel application of the Modified Angoff Method to rate case difficulty in simulation-based research

Melissa Joseph - Yale Center for Medical Simulation, Jungsou Chang - Yale School of Medicine, Samuel Buck, Jessica Ray - Yale University, Leigh Evans - Yale School of Medicine

Background and Objectives: Use of immersive simulation in research protocols and educational assessments is often limited by the fact that scenarios must be controlled for clinical difficulty when using repeated measures analyses. Piloting of simulations is time-intensive and may limit future participant pool. Our study aims to apply the Modified Angoff Method to reach expert consensus regarding difficulty of high-fidelity medical simulations for research purposes.

Methods: Eight high-fidelity simulation scenarios were developed for a study of the effects of clinical stressors on several participant parameters. Emergency Medicine physicians with expertise in healthcare simulation and resident education were asked to independently review each scenario and estimate the percentage of minimally qualified resident physicians who would successfully perform all critical actions of the scenario using the Modified Angoff Method. A standard deviation less than 10% (SD) of the estimated percentage correct for each scenario signified consensus. After an initial round of Angoff ratings, the experts discussed their justifications for rating and were asked again to independently rate the scenarios that had SD > 10%. Two-way ICC were calculated to determine the strength of inter-rater reliability between the experts in the rating rounds.

Results: During round 1, the experts rated 4/8 scenarios within 10% SD for PGY3 residents and 3/8 for PGY4 residents. In round 2, 6/8 sim scenarios were rated within a SD of 10 percentage points for both PGY3 and PGY4 participants. The remaining two scenarios were eliminated and not used in the ultimate study design. The ICC between round 1 (0.71 for PGY3 and 0.59 for PGY4, both p < 0.05) and round 2 (0.84 for PGY3 and 0.89 for PGY4, both p < 0.001) showed an overall increase in ICC between the rounds, indicating the agreement between the experts increased between the rounds of Angoff rating.

Conclusion: Final Angoff ratings by the EM simulation experts successfully quantified the estimated “percentage correct” within 10% SD for 6/8 cases after two rounds of Angoff ratings with overall increase in ICC, demonstrating consensus in estimating simulation case difficulty. This Modified Angoff Method is a feasible way to determine simulation difficulty for both educational and research control purposes and to decrease resources necessary for simulation piloting.
ABSTRACT

Amphetamine type stimulant use among Emergency Department patients with opioid use disorder

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Background and Objectives: Use of amphetamine type stimulants (ATS) can negatively impact treatment outcomes among individuals with opioid use disorder (OUD) and increase the risk of overdose and medical complications. We compared the sociodemographic and clinical features of Emergency Department (ED) patients with OUD who use ATS as compared to those who don’t.

Methods: Sociodemographic and clinical data obtained during the enrollment period between 2/2017 and 1/2019 of a study evaluating the implementation of OUD treatment initiation in emergency departments (EDs) in Baltimore, MD, New York, NY, Cincinnati, OH, and Seattle, WA (NIDA CTN 0069) was used in exploratory analyses. Urine samples collected from study participants meeting DSM-V criteria for OUD were tested for methamphetamine and amphetamine metabolites using instant immunoassay tests. Samples testing positive for methamphetamine, amphetamine, or both were classified at ATS positive.

Results: Among the study sample 150/396 (38%) were ATS positive. ATS positive as compared to ATS negative participants were more likely to be from the Midwest and West Coast EDs; younger: 36 (10) vs. 40 (12) years; a higher proportion of them were white: 104/169 (69%) vs. 114/246 (46%); a higher proportion had unstable housing: 101/150 (67%) vs. 121/246 (49%); a higher proportion presented at ED with opioid overdose: 32/150 (23%) vs. 33/246 (13%); and a higher proportion reported injecting drugs in the prior month: 118/150 (79%) vs. 115/245 (47%) (all p<0.05).

Conclusion: ATS use is prevalent among OUD individuals presenting to EDs in the Midwest and West Coast and was associated with specific sociodemographic and clinical features. Given the impact of ATS use on health and OUD treatment efforts, it is important to determine potential impact of ATS use on OUD treatment initiation and to develop ED-based screening and referral protocols for ATS using individuals utilizing urine tests and self-report.
ABSTRACT

Are We Failing Our High-Performing Residents?

David Della-Giustina - Yale University, Ali Kamran - Yale New Haven Hospital, Brian Wood, Katja Goldflam - Yale University

Background and Objectives: This study surveyed emergency medicine residency leaders nationally regarding their use of resident self-assessment, which residents performed them and which areas were assessed. Additionally, residency leaders were asked whether the self-assessments resulted in the development of an individualized learning plan (ILP) for each resident or if these were limited to any particular category of resident.

Methods: An initial literature review was performed by a medical librarian on previously published work on resident self-assessment. A survey was sent to all emergency medicine residency program directors on the Council of Residency Directors (CORD) listserv. Following a reminder message on the CORD listserv, additional email requests to complete the survey were sent directly to each non-responding program director. Results were obtained from February to April 2019.

Results: 119 out of 240 programs completed the survey (49.5%). 79% of programs have all residents perform an individual self-assessment. These were completed semiannually in 68.6% of programs, annually in 19.1%, less than annually in 8% and quarterly or more frequently in 4%. Programs ask residents to perform self-assessments in the following areas: clinical (36.0%), academic (33.2%), leadership (19.6%) and other (11.2%), which included personal growth, wellness, professionalism, and research. Based on the self-assessment, 21.2% of programs had all residents complete a formal ILP, 40.4% had only lower performing residents complete an ILP, and 38.3% did not have any residents complete an ILP.

Conclusion: While most programs have residents complete an individual self-assessment, less than a quarter have all residents perform an ILP. A majority of programs either have no residents or only lower performers complete an ILP. This leaves the majority of residents without guidance on how to improve in their personal areas of weakness. This is a component of residency training that may benefit from greater standardization and attention.
ABSTRACT

Association of Obesity with Resource Utilization and Clinical Outcomes in Chest Pain Observation Unit Patients

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Background and Objectives: The prevalence of obesity is increasing in the US, with implications for clinical outcomes, particularly in younger ages. We sought to describe stress test utilization and major adverse cardiovascular events (MACE) by body mass index (BMI, kg/m²) during an index visit among patients admitted to an Emergency Department Chest Pain Observation Unit (ED CPU).

Methods: A retrospective cohort review of electronic health record data was performed on consecutive ED CPU adult patients with angina equivalent symptoms. Patients with obesity (BMI 30-39.9) and severe obesity (BMI >40) were compared to those with normal BMI (18-24.9, reference group). We defined MACE as a composite of stroke, myocardial infarction, heart failure, and cardiovascular death. The unit of analysis was the index visit for each patient during the study period; analyses were patient-level. Outcome comparisons among groups were adjusted for common cardiac risk factors using regression analyses and are reported as adjusted odds ratios (OR).

Results: Between 01/2013-02/2018, there were 7,540 ED CPU admissions by 7,092 patients, with mean age 55 (±12) years, 56.2% female, 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 or severe obesity had lower proportions of exercise stress tests [Δ= -2.2% (CI 0- -4.4%) and -5.0% (CI -2.3- - 8.4)], and no difference in the proportion of pharmacologic stress tests [Δ= 0% (CI -1.3-1.2) and 0.3% (CI -2.1-1.5)]. Patients with obesity were more likely to have longer length of stays (OR, 3.5 95% CI, 2.3-5.2). No differences were noted for abnormal stress tests for patients with obesity (OR, 1.2 95% CI, 0.90-1.5) or severe obesity (OR, 1.1 95% CI, 0.70-1.6) as well as MACE within 1-year (OR, 0.93 95% CI, 0.59-1.5 and OR, 1.4 95% CI, 0.74-2.6) respectively.

Conclusion: Patients with elevated BMI make up the majority of admissions to the ED CPU, with implications for diagnostic tests and resource utilization. These patients were not found to have more abnormal stress tests or higher rates of MACE.
ABSTRACT

Computational Phenotyping of Heart Failure Patients in the Emergency Department

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Background and Objectives: Heart failure (HF) is a common presentation in emergency departments (EDs) worldwide and is associated with significant morbidity and mortality. Presentations of undifferentiated patients with histories of HF pose significant diagnostic and prognostic challenges. Computational disease phenotyping using electronic health record (EHR) data has the potential to aid in patient risk stratification and selection of therapeutic interventions.

Methods: This retrospective study included ED visits between March 2014 and July 2017 from three EDs. We first built a predictive EHR model of 30-day mortality on a general population using gradient boosting before validating it on the subset of patients previously diagnosed with HF. We used t-Distributed Stochastic Neighbor Embedding (t-SNE) to graphically represent HF patient ED courses and K-means clustering to define individual phenotypes.

Results: A total of 509,520 ED visits by 164,511 patients were used to generate a model of ED patient 30-day outcomes (AUC = 0.93 ± 0.005) which was then evaluated on the HF patient subgroup (30,471 total visits, 5,922 in validation cohort; AUC = 0.83 ± 0.02). Visits with low predicted mortality at 30 days (< 2%) represented 49.8% of all visits and had a 40.1% admission rate. Patients at intermediate risk (2-5% mortality at 30 days, 25% of all visits) had an 86% admission rate. ED vital signs, elements of the complete blood count and basic metabolic panels, pro-BNP, troponin, and lactate were informative in predicting visit outcomes and were used for visualizing phenotypes with tSNE. We observed two patient phenotypes: a low-risk cluster comprising 67% of visits that had a 30-day mortality rate of 2.6% and a high-risk cluster comprising 33% of visits with a 10.2% mortality risk. There were significant differences in ED interventions including diuretics (95% CI: [6.5 - 7.2]% vs [23.8 - 25.2]%), bi-level positive airway pressure ((0.09 – 0.19)% vs [10.6 - 11.82]%), intubations ([0.07 – 0.17]% vs [2.7 - 3.3]%), and admissions ([54.3 - 55.6]% vs [88.0 - 89.3]) between these groups.

Conclusion: Machine learning mortality risk assessment and computational phenotyping were used to reveal two illness-stratified, interpretable populations of ED patients with histories of HF.
ABSTRACT

Effect of Debriefing on Resident Recruitment Scores

Brian Wood, Ryan Coughlin - Yale-New Haven Hospital, Katja Goldflam - Yale University, Alina Tsyrulnik - Yale University School of Medicine, Raquel Harrison, Jessica Bod - Yale University, David Della-Giustina - Yale University

Background and Objectives: Annually, graduate medical education programs perform a rigorous screening and interviewing of applicants. Our interview days consist of an introductory session, a tour, interviews and a debriefing session for interviewers. During the debriefing, details of the applicant and their interview are reviewed. At the end of the review, each interviewer scores the applicant on a scale of 1 to 10, with 10 being the best score and 1 being the worst. This study seeks to examine the effect that the post-interview debriefing sessions have on the scores assigned by each interviewer to individual applicants. We hypothesized that scores would decrease after debriefing sessions and that resident-interviewer scores would change more than those of attendings.

Methods: Interviewers assigned each applicant a score on a 1-10 scale immediately following their interview. At the end of the day, a group debriefing session was held in which interviewers discussed each individual applicant and assigned them a new score. We examined the change in these scores. Only the post-debriefing scores were considered in the final ranking of applicants.

Results: Overall, all scores decreased by 0.23 points after debriefing sessions. Resident interviewer scores alone were initially higher at an average of 7.27 and decreased by 0.52 points after the debriefing session. Attending interviewers alone averaged 6.55 and decreased by 0.13 points. The difference between the change in scores for attendings and residents was 0.39 (p-value: 0.009). As expected, attending interviewers in general had more years of experience conducting interviews than residents.

Conclusion: Debriefing sessions generally decreased the scores of applicants and had a significantly greater effect on resident interviewer scores. Given these results, debriefing sessions are believed to be an important component of recruitment days and may be beneficial in training less experienced interviewers.
ABSTRACT

Emergency Department SBIRT of Substance Use in Victims of Community Violence: A Systematic Review

Edouard Coupet - Yale University, James Dodington, Alexandria Brackett - Yale University, Federico Vaca

Background and Objectives: Substance use is a modifiable risk factor that places victims of community violence, specifically assaultive injury, at substantially higher risk for re-injury. The aim of this study is to examine the current literature and determine emergency department (ED)-based strategies have been reported that screen, directly refer to specialized treatment, or treat substance use in victims of community violence.

Methods: A systematic review of prospective, ED-based studies was conducted. OVID, MEDLINE, OVID Embase, OVID AMED, Web of Science-Core Collection, Cochrane CENTRAL, and CINAHL were searched using keywords and MeSH terms. Studies were excluded if they only involved intimate partner violence or only evaluated alcohol use. Strategies were categorized as screening, direct referral, or treatment of substance use. Study heterogeneity excluded a meta-analysis.

Results: Of the 1613 studies identified, 11 full text articles were included in the final analysis. The articles covered 11 journals. All of the studies involved screening substance use among victims of violent injury, while no study evaluated a referral to treatment or an intervention.

Conclusion: We reviewed 11 prospective studies that involved ED-based strategies that screen, directly refer to treatment, or treat substance use among victims of community violence. These findings suggest there is a paucity of ED-based strategies that subsequent refer to or evaluate treatment in this high-risk population.
Geriatric Emergency care Applied Research (GEAR) network: prioritizing research on falls

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Background and Objectives: GEAR convened an interdisciplinary task force of stakeholders to identify the state of the science for falls and propose research priorities for effective patient-centered geriatric emergency care.

Methods: GEAR investigators include professionals in geriatrics, emergency medicine, nursing, social work, psychology, pharmacy, and patients. GEAR identified the two priority Patient-Intervention-Control-Outcome (PICO) questions: interventions to reduce the incidence, recurrence and sequelae of falls (PICO-1); and the impact of fall risk stratification and care plan on the quality of ED care metrics and ED operational outcomes (PICO-2). GEAR completed a scoping review for both PICO questions and identified literature gaps. The results were presented at the GEAR Consensus Conference in October 2019 using the CITRA model. The 56 GEAR investigators synthesized the data and ranked priority questions anonymously.

Results: For PICO-1, 23 of 32 included studies were randomized controlled trials (RCTs). Interventions included patient/provider education, referral to physical therapy, or both. Trials with extended physical therapy consistently reduced the incidence of recurrent falls. For PICO-2, 7 of 21 studies were RCTs. Ten screening tools were evaluated and were often combined with interventions. Patient outcomes improved in 29% of studies. Screening did not reduce the risk of falls. Voting at the Consensus Conference on prioritization of top 5 research foci are as follows (higher to lower ranked): 1. Analyzing the effectiveness of individual components of fall interventions; 2. Determining the optimal outcomes to assess after fall-related ED encounters; 3. Identifying patient-prioritized outcomes and patient-targeted interventions; 4. Improving fall etiology assessments to better inform interventions and; 5. Identifying the optimal role of EMS in assessment, information transfer, intervention, and connection to existing resources after a fall.

Conclusion: There is a lack of large-scale RCTs, including the identification of interventions to reduce incident and recurrent falls. GEAR stakeholders recommended priority research focus on fall intervention trials. In the future, GEAR will test ED-targeted fall intervention strategies at 3 hospitals that are part of the Geriatric Emergency Department Collaborative.
ABSTRACT

Interventions to Improve Nursing Home – Emergency Department Transitions of Care: A Systematic Review

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Background and Objectives: Visits to the ED by older patients are a driving force in emergency care demand, as 1.6 ED visits occur annually for each NH resident. Despite the high prevalence of ED visits by NH residents and projected increases in the population of older adults 65 and older, little work has focused on how to improve the NH-ED transitions of care. Our aims were to (1) summarize the literature involving transitions of care for patients from NH facilities to EDs, and (2) identify interventions that are effective in improving patient-oriented, systems-oriented or health services utilization outcomes when a transfer occurs.

Methods: This systematic review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and was registered a priori. With the assistance of a medical librarian, we identified a combination of key words and concepts that were translated to equivalent standardized terms for all database and grey literature searches. Two reviewers independently screened all retrieved titles and abstracts according to the inclusion and exclusion criteria. A formal assessment of quality and bias were performed on the included articles.

Results: A total of 607 studies were identified, from which 19 studies were included for full-text review. Nine pre-post intervention studies and two retrospective cohort studies met all criteria for inclusion. In the quality assessment, two (18.2%) were assessed as good quality, seven (63.6%) were fair, and two (18.2%) were poor. Nine studies (81.2%) had a severe risk of bias, primarily due to confounding and deviation from the intended intervention. Eight studies reported significant improvement in critical NH-ED transfer information completeness after intervention implementation. Two studies reported no reduction in healthcare utilization after intervention implementation and one study reported decreased 30-day hospital readmission and ED revisit rates.

Conclusion: Transfer checklists, web-based communication networks, and multimodal approaches are used in NH-ED transitions of care. Intervention-based studies are largely of fair quality and have a severe risk of bias. Studies evaluating patient-centered outcomes such as whether interventions reduced harm to patients by decreasing medical errors, hospital length of stay or the overall number of facility transfers are needed.
ABSTRACT

Length of Stay for Adults with Suicidal Ideation in the Emergency Department and Inpatient Setting

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Background and Objectives: Boarding of patients with psychiatric complaints is a concern in the Emergency Department (ED). The aim of this study is to investigate factors for patients presenting with Suicidal Ideation (SI) associated with increased length of stay (LOS) in the ED and for admitted patients.

Methods: A retrospective chart review of adult patients evaluated and treated at an urban ED for a chief complaint of “Suicidal” or “Suicide Attempt” was conducted from August 2015 to September 2016. Associations were evaluated between LOS and potential covariates. All statistical analyses were carried out in SAS 9.4. To assess the factors affecting LOS, we utilized a multivariable Poisson regression model, adjusted for overdispersion. We calculated rate ratios (RR) considering gender, race, living situation, insurance status, phencyclidine use, amphetamine use, hallucinogen use, alcohol use and number of ED visits as potential risk factors.

Results: Patients were included if they were 18 or older and received a psychiatric consult. 1150 patients were included. Average age was 39 (SD=12). 60.87% were male (N = 700); 50.74% identified as non-Hispanic (NH) Black (N = 581), 45.15% identified as NH White (N = 517), 4.10% (N = 47) identified as Hispanic, Vietnamese, or other (HVO). 97.30% were suicidal (N = 1119); 68.22% reported alcohol use (N = 777); 7.99% reported amphetamine use (N = 91); 31.64% were admitted (N = 362). In the ED, NH Black patients had increased LOS compared to NH White patients (RR = 1.13, 95% CI: 1.00 - 1.28). Alcohol use increased LOS (RR = 1.18, 95% CI: 1.03 – 1.35) and older age decreased LOS (RR = 0.9946, 95% CI: 0.9894 – 0.9999). For admitted patients, HVO patients had increased LOS compared to NH White patients (RR = 1.82, 95% CI: 1.17 – 2.83). Alcohol use (RR = 0.76, 95% CI: 0.59 – 0.999) and amphetamine use (RR = 0.6141, 95% CI: 0.38 – 0.996) had decreased LOS.

Conclusion: This study identified factors that affect LOS in the ED and inpatient settings. NH Black patients and patients with alcohol use were identified as predictors of increased LOS in the ED. Older age correlated with decreased LOS in the ED. For admitted patients, HVO patients correlated with increased LOS and alcohol and amphetamine use correlated with decreased LOS. These findings show continued evidence of disparities in ED and inpatient care and encourage further research on social factors that contribute to this disparity.
Resident Perception of a Publicly Disclosed Daily Productivity Dashboard

Katja Goldflam - Yale University, Colin Flood - Yale University, David Della-Giustina - Yale University

Background and Objectives: Productivity, as measured by patients seen per hour, is a key metric used in evaluating the performance of attending emergency physicians. Since 2016 our residents have received a daily public dashboard via email, detailing the number of patients seen by each resident as well as timeliness measures on the preceding day. We assessed residents’ perceptions of this dashboard in order to derive insights for future improvements in support of better resident education.

Methods: We performed an anonymous survey of all PGY 1-3 residents in our four-year emergency medicine residency regarding the daily productivity dashboard. Residents were asked their perceived utility of the data provided, how often it was reviewed and how reflective they thought it was of their actual performance. Residents were further asked to identify additional quality and performance data they would be interested in receiving. Most data were collected on a 5-point Likert scale, along with a qualitative component for write-in suggestions.

Results: Forty-three (100% of eligible) residents completed the survey. Thirteen (30.2%) rarely or never reviewed the dashboard. None of the residents felt it measured their productivity or quality of care “extremely accurately” or “very accurately”. More residents felt the dashboard was “not accurate at all” in reflecting their quality of care (28, 65.1%) than their productivity (7, 16.3%). Almost all residents expressed interest in receiving personalized lists of patients who returned to the ED (37, 86.0%) or who had an escalation of care over 24 hours (39, 91.0%). Qualitative feedback collected included concern about “gaming the system” resulting in inaccurate data collection on the dashboard and valuing of “throughput over high quality, thorough care”.

Conclusion: Almost one-third of residents rarely to never used the dashboard for feedback. Most residents felt the dashboard did not accurately reflect their perceived on-shift performance or quality of care delivered. A majority expressed interest in a personalized list of cases for targeted follow-up. These insights will be useful in guiding future development of feedback dashboards for residents to maximize their education.
ABSTRACT

Sex Differences in Clinical Profile and Stress Tests in Patients with Obesity and Chest Pain

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Background and Objectives: Obesity is an ever-growing health concern in the United States, with 71.6% of adults being overweight or obese. We report sex differences between obese patients with chest pain admitted to an Emergency Department (ED) chest pain unit (CPU) regarding demographics, clinical profile, cardiac stress test, and length of stay.

Methods: We retrospectively reviewed electronic health records of all adult patients >18 years old, admitted to the chest pain center (CPC) at an academic medical center from 2013 to 2018. Collected patient data included sex, race, body mass index (BMI; kg/m2), smoking status, presence of coronary artery disease (CAD), hypertension, diabetes, dyslipidemia, emergency severity index (ESI), length of stay, and type of stress test (exercise vs. pharmacologic). Obesity was defined as body mass index (BMI) ≥30 and moderate-severe obesity (BMI ≥35). We compared obese males and obese females: proportions were analyzed using chi-square and continuous variables using t-test.

Results: 7,540 patients were admitted to CPU, with a mean age of 55.31 (±12.4), with 56.4% female. The prevalence of obesity was higher in women than in men (46.88% vs 41.69%; p<0.0001). There were more overweight men than women (38.59% vs 29.30%; p<0.0001). Women had a higher proportion of normal BMI than men (22.03% vs. 18.54%; p<0.0001).

Compared to men, obese females were more often Black (38.1% vs. 22.2%; p<0.001), Hispanic (18.6% vs. 15.7%; p=0.032), and with Medicaid/Medicare (41% vs. 37.9%; p=0.008). Obese males had a higher mean length of stay than obese females (29.13 vs. 25.51 hours; p<0.0001).

Obese men had a higher rate of tobacco use (12.0% vs. 8.6%; p=0.001), history of CAD (10.8% vs. 6.1%), (15.7% vs. 12.4%; p=0.018) and lower rate of prediabetes (2.0% vs. 3.4%; p=0.023) and hypertension (54.4% vs. 58.8%; p=0.034) than obese women. There was no difference in other cardiovascular risk profiles, namely family history of CAD, hyperlipidemia, chronic kidney disease, obstructive sleep apnea, diabetes, and ESI (p>0.05). Obese women had higher rates of pharmacological stress tests than men (38% vs. 31%; p <0.01)

Conclusion: More obese women than men are admitted to the CPU. They present with different cardiac risk factors and exhibit different lengths of stay.
ABSTRACT

Shift Work in the Age of Anytime Anywhere Access to the Medical Record

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Background and Objectives: The electronic medical record (EMR) has been found to decrease time residents spend with patients and increase time spent working after scheduled hours. Currently, little is known about the effects of the EMR on resident work patterns in EM. We analyzed EMR timestamps to better understand EM resident work patterns on and off shift and the accuracy of self-reported duty hours.

Methods: We collected EMR log-in/log-out timestamp-data and self-reported duty hours across a 260-day study period for 60 residents in a PGY1-4 EM residency program. Periods of EMR activity were coded as corresponding to scheduled shifts (“on-shift EMR access”) or outside of scheduled shifts (“off-shift EMR access”) and were compared to self-reported duty hours. We excluded non-ED time periods (e.g. ICU rotations) from our analysis.

Results: The rate of off-shift EMR access varied widely among residents (median 10 episodes/resident; range 0–133 episodes/resident). Most episodes (51%) occurred on days off (no clinical duties scheduled). Fewer occurred after shifts (24%) or before shifts (27%). The median episode duration was 18 minutes. Only 9% percent of off-shift episodes were reported in the duty-hours self-reporting system. In addition, we found that on-shift EMR access often exceeded scheduled shift time and was inaccurately reported in the self-reporting system. The proportion of shifts for which on-shift EMR access exceeded scheduled shift time varied widely among residents (median 0.52; range 0.14-0.95), but correlated moderately with the frequency of off-shift EMR access (Pearson’s r = 0.43; 95%CI 0.19-0.61; P<0.001). Self-reported duty hours in excess of scheduled shift times correlated only weakly with excess hours of on-shift EMR access (Pearson’s r = 0.23; 95%CI 0.19-0.26; P<0.001).

Conclusion: Off-shift EMR access is common but highly variable among residents at our site and is poorly accounted for in the duty-hours self-reporting system. Residents who frequently access the EMR off shift are also more likely to exceed scheduled shift times. The methods demonstrated in this study could be used to improve auditing of duty-hours compliance. Future research should explore the relationship between excess or off-shift EMR usage and individual measures such as productivity and burnout.
ABSTRACT

Task Stress State during medical simulation and stress inoculation training in Emergency Medicine

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Background and Objectives: EM physicians suffer disproportionately from burnout. Defined as job-related exhaustion, increased mental distance, negativism, and reduced efficacy, burnout affects not only physicians but patients under their care. We aimed to test whether an Emergency Medicine Stress Inoculation Training (EM-SIT) protocol affected acute task stress profiles, measured by the Short Stress State Questionnaire (SSSQ), experienced by resident trainees during simulated patient encounters.

Methods: The EM-SIT protocol consisted of three phases: education, skill introduction and practice, followed by immersive simulation-based skill practice. These phases aimed to equip the participants of signs and symptoms of burnout and methods for relaxation, both in real-time as well as post-stress. In the week prior and week following EM-SIT, 9 EM residents participated in an additional 6 high-fidelity simulation cases, before and after which SSSQ were collected. Questionnaires were analyzed by parsing questions into categories of “Distress”, “Engagement”, and “Worry.” Participant state changes from the EM-SIT training day were compared to the non-training simulation days.

Results: SSSQ averages (M) and standard deviation (SD) were calculated based on a score of 1-5 for with 5 indicating the highest agreement with the emotions statement. Average of SSSQ pre-scenario were calculated across all simulations (“Distress” – M = 1.44, SD = 0.40, “Engagement” – M = 3.21, SD = 0.50, “Worry” – M = 2.20, SD = 0.74). SSSQ state change for the non-SIT scenarios (“Distress” – M = 1.42, SD = 0.41, “Engagement” – M = 3.40, SD = 0.42, “Worry” – M = 2.28, SD = 0.73) was calculated separately from the EM-SIT simulation (“Distress” – M = 1.51, SD = 0.49, “Engagement” – M = 3.61, SD = 0.27, “Worry” – M = 2.25, SD = 0.64) to isolate the effect of stress inoculation training. There was greater “Engagement” after the EM-SIT in comparison to the other scenarios, while Distress or Worry were not significantly different.

Conclusion: Using the SSSQ as an indicator of state change, there is evidence of increased engagement among the participating EM residents after SIT. Given that increased mental distance is a diagnostic component of trainee burnout, this may represent a feasible way to help combat it. Further study is planned with follow up of longer-term burnout indices and skill integration practices.
ABSTRACT

The Association of Sleep Hygiene and Drowsiness With Adverse Driving Events Among Emergency Medicine Residents

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Background and Objectives: Prior research regarding sleep deprivation in physicians has centered on patient care outcomes without much focus on the safety of the physicians themselves. Emergency medicine physicians in training often work sporadic overnight shifts, a known risk factor for drowsy driving which could potentially have important safety implications for these physicians. We aimed to explore the relationship between sleepiness, overall sleep hygiene, level of training, and adverse driving events following an overnight shift in this population.

Methods: After working an overnight shift at a community hospital site 20 miles from their primary training facility, 50 emergency medicine residents ranging from Post-Graduate Year 1 through 4 completed self-administered surveys regarding their sleepiness before and after their drive home, any adverse driving events that occurred during their drive home, and their overall sleep hygiene.

Results: Three participants did not drive home and were excluded from the analysis regarding adverse driving events. Sleepiness was significantly associated with adverse driving events (Beta = 0.31; p < .001). Residents with high sleepiness levels reported significantly more adverse driving events. Residents reported significantly higher sleepiness levels after completing their drive home (Mean = 7.04, SD = 1.41) compared to sleepiness levels before driving home (Mean = 5.58, SD =1.81). Residency training level was significantly associated with adverse driving events (Beta = - 0.59, P < .01). Senior residents reported significantly less adverse driving events compared to junior residents.

Conclusion: Emergency physicians in training are at risk for drowsy driving related motor vehicle crashes following overnight work shifts. Trainees of all levels underestimate their true degree of sleepiness prior to initiating their drive home, while junior residents are at higher risk for adverse driving events. Residents could likely benefit from intentional education about the dangers of drowsy driving and strategies to reduce this behavior. Future studies should consider building off our findings to obtain more objective data using high fidelity driving simulation or a naturalistic driving research approach with a larger number of participants from several training programs.
ABSTRACT

Ultrasound Measurement of Pediatric Chest Wall Thickness: Implications for Needle Decompression of Tension Pneumo

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Background and Objectives: Needle decompression is potentially life-saving in cases of tension pneumothorax. While Advanced Trauma Life Support (ATLS) recommends an 8-cm needle for decompression for adults, no detailed guidelines exist for pediatric populations, specifically regarding needle length or site of decompression. Our study aims to provide recommendations for providers facing the need to perform needle decompression in pediatric patients.

Methods: Our study used point-of-care ultrasound (Philips Sparq Ultrasound System) to measure chest wall thickness (CWT), namely the distance from skin to pleural line bilaterally at the 2nd intercostal midclavicular lines and the 4th intercostal anterior axillary line in children of various ages and sizes. We grouped patients based on Broselow tape categories. We compared the differences between left vs. right sides at the two anatomic sites using measures of mean, standard deviation, confidence interval, unpaired t-tests, and other descriptive statistics. We calculated interclass correlation coefficient to assess for interrater reliability.

Results: We enrolled a convenience sample of 163 patients from our emergency department. For patients smaller than the largest Broselow category, CWT at the 2nd intercostal midclavicular line ranged from 1.11 to 1.91 cm, and at the 4th intercostal anterior axillary line ranged from 1.13 to 1.92 cm. Furthermore, in patients larger than the largest Broselow category, 77% had a CWT less than the length of a standard 1.25 inch (3.175 cm) catheter. There were no significant differences in the measurements of CWT based on laterality and anatomic site.

Conclusion: The standard 1.25 inch (3.175 cm) catheters are sufficient to treat the majority of tension pneumothoraces in pediatric patients at either the 2nd intercostal midclavicular line or the 4th intercostal anterior axillary line.
ABSTRACT

User-Centered Clinical Decision Support for Emergency Department-Initiated Buprenorphine: a Pilot Study

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Background and Objectives: Adoption of emergency department (ED)-initiation of buprenorphine (BUP) for opioid use disorder (OUD) into routine emergency care has been slow, partly due to clinicians’ unfamiliarity with this practice and perceptions that it is complicated and time-consuming. To address these barriers and guide emergency clinicians through the process of BUP initiation, we implemented EMBED (EMergency department-initiated BuprenorphinE for opioid use Disorder), a user-centered computerized clinical decision support system (CDS). This pilot study was conducted to evaluate the efficacy of EMBED to increase the rate of ED-initiated BUP.

Methods: A pilot study was conducted in an urban, academic ED from April-August 2018 (pre-implementation phase) and April-August 2019 (post-implementation) to study the effect of the intervention on adult ED patients identified by a validated EHR-based computable phenotype consisting of structured data consistent with potential cases of OUD who would benefit from BUP treatment. The EMBED intervention offers flexible CDS for identification of OUD, assessment of opioid withdrawal, motivation of readiness to start treatment and automates EHR activities related to ED-initiation of BUP (including documentation, orders, prescribing, and referral).

Results: Of the 41,916 unique patients presenting to the ED over both study periods, 586 (288 pre and 298 post) met study inclusion criteria. The rate of BUP initiation increased from 2.8% (8/288) in the pre-implementation phase to 7.0% (21/298) in the post-implementation phase (p=0.02). The rate of naloxone prescribing at discharge also increased (3.1%, pre-implementation; 12.1%, post-implementation; p<0.001).

Conclusion: Implementation of user-centered CDS at a single ED was associated with increased rates of ED-initiated BUP and naloxone prescribing in patients with OUD. In an upcoming trial, we will implement this intervention across several health systems to assess its effectiveness, scalability, and generalizability.
Utility of Peripheral Reactive Hyperemia Index in Assessing Coronary Flow Reserve in Emergency Department Patients

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Background and Objectives: We assessed the utility of EndoPAT, a digital peripheral arterial tonometry device that measures reactive hyperemia index (RHI) as a clinical screening tool for identifying low coronary flow reserve (CFR). Distinguishing normal from low CFR is of importance in assessing for either microvascular dysfunction or large vessel coronary disease. Low CFR imparts a poor prognosis with recurrent chest pain even without typical CAD and requires advanced cardiac imaging to diagnose.

Methods: From June 2014-May 2019, in a convenience sample, we measured RHI in adults undergoing a clinically indicated cardiac Rubidium-82 positron emission tomography/computed tomography (PET/CT) at a single center (69% from ED or inpatient and 31% outpatient). Exclusion criteria were inability to consent, lack of English proficiency, and physical limitation impairing Endopat use. We defined low RHI as <1.67 and low CFR as <2.0. Distribution of RHI was skewed so we used its natural logarithm (LnRHI) to calculate Spearman correlation and area under the curve (AUC). We estimated sample size of 99 to show discriminatory power of RHI defined by AUC >65%.

Results: Of 265 patients with PET/CT, we enrolled 131, and 100 had adequate data. Patients had a mean age of 61 years (SD 12), 46% were female, 29% non-white with mean TIMI score of 1.36. Twenty-nine patients had low CFR and thirty-six had low RHI. LnRHI did not distinguish patients with low from normal CFR (AUC=0.53; 95% CI, 0.41-0.64) and did not correlate with CFR (r=-0.039, p=0.7). The clinical profile of patients with low CFR and low RHI varied. Patients with low CFR were significantly older (mean 70 vs. 57 years), with known CAD (59% vs. 21%), dyslipidemia (93% vs 56%), coronary artery calcification (79% vs. 46%), and perfusion defect (55% vs. 25%) compared to patients with normal CFR (p <0.05). RHI was lower in patients with recurrent chest pain than those without (mean difference=1.18; 95% CI, 1.03-1.35). However, low RHI did not distinguish patients with traditional CAD risk factors, presence of calcification or perfusion defect (p >0.05).

Conclusion: Peripheral RHI does not suffice as a clinical screening tool to identify patients with low CFR as measured by cardiac PET/CT. Differences in vascular pathology assessed by each method may explain this finding. More research is needed to screen for microvascular dysfunction in addition to typical CAD.
ABSTRACT

Where Skilled Nursing Facility Residents Get Acute Care—Is the Emergency Department the Medical Home?

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Background and Objectives: As a result of frailty, disability and social determinants of health, care delivery is often fragmented among older adults between emergency department (ED), hospital, and office-based settings, particularly those residing in skilled nursing facilities (SNF). Underlying much of the discussion of reducing ED visits among SNF residents is the perception that SNFs provide limited acute care. This study aims to characterize the distribution of acute care visits among Medicare beneficiaries receiving SNF services.

Methods: We conducted a cross-sectional analysis of a 20% sample of continuously enrolled Medicare beneficiaries in the 2012 Chronic Condition Warehouse dataset. Beneficiaries were defined to have received no SNF care or were grouped by the number of days of SNF services reimbursed by fee-for-service Medicare in the study year. We identified all ED visits and select office visits as acute based on previously published definitions. The primary outcomes were total visits, acute visits, and acute visits without hospitalization. We report the outcome stratified by location (outpatient offices, SNF, ED) and provider type (primary care, specialty, ED).

Results: Among the 10,717,786 Medicare beneficiaries analyzed, 384,312 (3.6%) had at least one SNF stay during 2012. Those with SNF stays were older with a higher prevalence of comorbid conditions. Beneficiaries with SNF stays of any duration were more likely to visit the ED for acute care (24.4% vs. 13.1%); however, this difference was smaller when we excluded acute visits resulting in same day hospitalization (12.3% vs. 10.1%). Among beneficiaries with SNF stays greater than or equal to 100 days for the study year, ED visits constituted 27.9% of acute care visits when they were not staying at SNFs, compared to 13.1% when they were staying at SNFs. The difference remained notable after excluding visits leading to admission (14.5% vs. 7.2%).

Conclusion: SNF residents have higher overall acute care needs, but were more likely to utilize the ED for acute care when they were not staying at SNFs.
Development of a Customizable 3D-printed Ultrasound-guided Intravenous Catheter Task Trainer

Ting Xu Tan; Samuel Rylowicz; Ying Ying Wu; Ge Bian; Ian Riley; Kenji Shimada

Intro/Background: Ultrasound-guided intravenous catheter (USIV) placement is an important but challenging procedure to reach competency. It is frequently taught using commercial models or homemade phantoms. While these models are useful for basic introduction to USIV insertions, they lack anatomic realism and may not simulate varied challenges faced by the learner. Homemade blocks made of materials like gelatin are usually single-use and degrade quickly, while commercial products are expensive and lack vessel customizability.

Purpose/Objective: Our group sought to design, develop and test an economical, customizable 3D-printed USIV task trainer.

Methods: The prototype task trainer was constructed using 3D-printing and casting techniques. It has a base and an interchangeable “inner arm” piece where the vessels are located. The model was tested by clinical users in comparison to a commercial model. Feedback and observations from testing were used to improve the model. Varied vessel trajectories and sizes were also incorporated to test base model customizability. Materials cost for the entire model was approximately $70.

Outcomes (if available): Twenty-one users (emergency medicine residents and attendings) tested the prototype. Compared to the commercial model, users felt the 3D-printed model was more realistic in its overall appearance, skin layer, vessel orientation, IV catheter insertion, and overall difficulty. Users also felt that compared to the commercial model, the 3D-printed model more closely simulated placing an USIV in a patient. Overall 90% of users would recommend the 3D-printed model over the commercial model for teaching USIV placement.

Summary: A novel economical and customizable 3D-printed USIV task trainer was developed to address the limitations of current commercial and homemade task trainers. The 3D-printed task trainer compared favorably against the commercial model when tested by clinical users.
Educating Future Educators: The Design and Implementation of "Resident as Educator" Distinction

Alina Tsyrulnik; Sandra Seelig; Katja Goldflam; Jessica Bod; Ryan Coughlin

Intro/Background: Resident-as-teacher programs are becoming more common throughout Emergency Medicine residencies. However, majority of these curricula focus on bedside teaching and are created as lecture-based learning of teaching methods, single workshops, or month-long electives. There is a dearth of programs that are intended to promote longitudinal, multimodal learning over the entirety of residency and develop residents into educators through a combined approach and with graduated responsibilities from lecture-based education to hands-on experiential opportunities.

Purpose/Objective: The purpose of this project was to implement a resident-as-educator program intended on fostering clinician educators. This included foundational didactics on adult learning theory, curriculum and lecture design opportunities, experience in medical education scholarship, as well as clinical and lecture-based teaching. The hope was to foster a new, diverse skill set in residents with a particular interest in medical education and ultimately aid with potential career goals.

Methods: A structured, longitudinal, “credit-based” curriculum was created to include three distinct “domains of development”: teaching, scholarship, and personal learning/development. Yearly goals with credit requirement were used as markers of progress through the curriculum and to assure that all three domains were being addressed by each resident. This approach allowed learners to get an individually-designed curriculum geared towards their particular interests, and at the same time assured that their education and experience remains diversified.

Outcomes (if available): Approximately 1/3rd of residents from each post-graduate year have participated in this program since inception. The first graduating class that had the opportunity to enroll in the curriculum graduated in 2019, with two graduates having completed all requirements and attaining a “Distinction in Education” diploma.

Feedback has been positive. In particular, residents appreciate the dedicated time toward learning the foundations of medical education as well as having a scaffold to reference for their personal development.

Summary: The purpose of this curriculum is to foster the development of resident educators and help establish their careers in the field of medical education. Residents can opt-in to participate and supplement their current residency curriculum with a focus on medical education. The topics that the learners are exposed to include: foundations and application of adult learning theory, curriculum development, lecture and small group format of teaching, simulation and ultrasound education for medical students and residents, opportunities to mentor medical students, and gain experience with medical education scholarship. These experiences are subdivided into three “domains of development”: teaching, scholarship, and personal learning/development. Throughout their four years of residency, those who choose to participate in this curriculum are expected to have a certain number of educational experiences within each domain. Their progress is tracked by a point system. A certain amount of points within each domain, must be achieved by graduation in order to achieve a “Distinction in Medical Education” upon graduation.

This innovation addresses the current gap in existing “resident as educator” curriculums that focus developing resident educators primarily through bedside and/or lecture-format through lectures, singular workshops, or electives. Instead, the curriculum developed is a multi-year, longitudinal experience that enables residents to retain new skills and integrate them during their residency education through “hands-on” experiences. While the learner is able to individualize his/her learning to specific interests within education, the design ensures a diversified educational background and experience. The hope is to help residents who have a particular interest in medical education and wish to pursue careers in graduate and post-graduate medical education develop into well-rounded
clinical educators. This curriculum design is not only easily generalizable to other Emergency Medicine residency programs, but can be useful to medical education across all other specialties.