Abstracts for the 36th Annual Emergencies in Medicine Conference

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Abstract

The 36th Annual Emergencies in Medicine Conference was held at the Hyatt Centric Hotel in Park City, Utah, from February 25 to March 1, 2018. The conference is designed by Emergency Medicine physicians to be short, engaging, and informative. Conference involved a series of fast-paced 30-min lectures from international leaders in Emergency Medicine about cutting-edge research. The following were the abstracts that were presented at the conference. There was a competition for the best abstract, determined by a vote of all the conference attendees, for which the winner received the title of “2018 Best Emergencies in Medicine Abstract,” and a cash award of $500. This year the award went to “Stethoscope Cleaning Practices: The Dirty 3rd Hand of Modern Medicine.”

Keywords: Abstract summary, conference summary, emergency medicine

Development of a Metric Score for a Digital Marker of Head Injury

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Background: Traumatic brain injury (TBI) affects patients of all ages, accounts for nearly 30% of all injury deaths in the US, and 2.5 million emergency department (ED) visits in 2013. Neurocognitive tests are used to diagnose mild TBI (mTBI). We created BrainCheck, a digital, gamified neurocognitive test based on the current gold standards to determine the cutoff point along a sensitivity/specificity threshold curve to maximize diagnostic utility. Methods: Patients completed written informed consent form approved by the IRB before enrollment. Patients included were between the age of 18 and 64, had full function of both hands, were proficient in English or Spanish, had Glasgow Coma Scale of 14 or 15, had a physician diagnosis of mTBI, and ortho controls with clinically determined similar amounts of pain without head injury. Patients excluded were those with TBI in the past 6 months, preexisting neurological condition, <4 h of sleep the night before, strenuous physical activity within 1 h of testing, and drug/alcohol use <12 h prior. After enrollment and within 24 h of physician diagnosis, patients were administered test via an iPad. Results: We enrolled 30 mTBI patients (53% males, median age 32.2) and 30 ortho controls (40% males, median age 33.6). We created an algorithm to generate a composite score to discriminate patients with mTBI. Scaled and weighted to equal 30 points, this optimized linear sum of scores showed a significant difference in mean scores between the mTBI group and the control group (P < 0.00003). The sensitivity/specificity as a diagnostic tool for mTBI were 83%/87%. A score <10 was highly sensitive, while a score >20 was highly specific. Conclusion: BrainCheck can be used to aid in the diagnosis of mTBI. A BrainCheck score <10 could be sensitive enough to identify patients in whom additional, extensive, time-consuming, expensive workups, would not yield additional benefit and could be potentially safely discharged home from an ED.

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What to Keep in the Front of Your Mind When Presented With Back Pain

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Introduction: Back pain is one of the most common complaints in the emergency department (ED). According to the Centers for Disease Control, there were over 4 million visits to the ED in 2014 for “back complaints.” Most of the complaints were related to benign musculoskeletal issues that resolve with minimal to no treatment. However, there are life-threatening mimickers that must be ruled out. Case: A 52-year-old male with a history of “back surgery” presented to the ED three times and to his primary care physician (PCP) once in the past 12 days with back pain. On his first visit, he presented with low back pain with radiation down his right leg and believed the pain was consistent with his chronic back pain. The patient was given Toradol and was discharged home. A week later, the patient followed up with his PCP and stated that his pain was worse with early satiety, nausea, and vomiting. On his third ED visit, the patient did admit to a 20 lb weight loss and abdominal pain. His back examination was unchanged without neurologic findings, but he had tachycardia, abdominal distension, hepatomegaly, and jaundice. He had a leukocytosis with bandemia and thrombocytopenia. His alkaline phosphatase was 363, total bilirubin 6.2, and lipase 154. He had a lumbar X-ray and a computed tomography abdomen/pelvis which showed acute pancreatitis and an adrenal mass. There was a concern for biliary obstruction and he went for ERCP. He was found to have a common bile duct stricture and had a stent placed with brushings. He was unable to extubate and became hypotensive requiring pressor support. The patient developed fixed pupils bilaterally, became unresponsive, and expired. Autopsy demonstrated a cerebellar hemorrhage and a mass in the biliary tree extending to the pancreas. Pathology demonstrated cholangiocarcinoma. Discussion: It is important to keep a broad differential when presented with back pain. Although this is a common presentation to the ED, treating the symptoms without consideration of alternative diagnoses may not be sufficient, particularly with recurrent presentations.

Pacemaker and Defibrillator Interrogations in the Emergency Department and Hospital Rarely Necessitate Reprogramming

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Background: Availability of read-only interrogation systems for use in patients presenting with complaints related to cardiac implantable electric devices (CIEDs) is increasing. One barrier to adoption of the technology is the belief that interrogation will usually require a trained technician to adjust CIED programming, which cannot be accomplished through the current systems. Our objective was to investigate the frequency that CIED interrogation identified a need for immediate device reprogramming. Methods: We performed a retrospective chart review using data from a single hospital, 2 emergency department (ED) system, with a combined annual ED census of 70,000 visits. From April 29, 2015 to April 3, 2017, hospital and ED patients with known Boston Scientific CIEDs and potential device-related complaints were evaluated by the Latitude Consult interrogation system (Boston Scientific, Inc., Marlboro, MA). Interrogations were performed by ED and hospital staff. T-test was used for continuous variables and Fisher’s exact test to compare categorical variables. Results: During the study period, a total of 176 interrogations were performed. The cohort had a mean age of 72.5 years and contained 103 (59%) males. Cardiac episodes were discovered in 82/176 interrogations and 10/82 of those required further review or programming optimization. Overall, 25 interrogations were flagged for further review. There was no difference in age or sex between groups. In the “review required” subgroup, 18/25 (72%) had normally functioning devices with subacute relevant findings that did not require immediate attention. There were 7 (28%) of the further review group and 4% of the total sample) devices that required immediate reprogramming intervention for device dysfunction. Conclusion: Clinically relevant cardiac events were discovered in 46% of interrogations performed, indicating that CIED interrogation is frequently value added to patient care. The need for immediate device reprogramming was rare, at 4% for the group.

Forty-five percent of Pacemaker and Defibrillator Patients Present Without Device Identification Cards

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Background: Cardiac implantable electronic devices (CIEDs) such as pacemakers and defibrillators record critical clinical data, but health-care providers cannot access this data without knowing the device’s manufacturer. Every CIED patient is given an identification card indicating the device’s manufacturer. Patients presenting to EDs without ID cards can represent delays in care, requiring time to be
spent contacting possible manufacturers. To the best of our knowledge, no studies have examined the rate at which patients present to EDs with their identification cards. This study’s purpose was to determine the rate at which CIED patients presented to an ED with their ID cards.

**Methods:** The study site is a Mid-Western hospital with an ED servicing an average of 70,000 patients per year. After obtaining the IRB approval, a convenience sample of CIED patients presenting to an ED at all times of the day was performed. Patients were identified by research staff within the ED, after which undergraduate students documented data on a standardized collection form. **Results:** A total of 106 patients met the entry criteria and were enrolled from June 2013 to September 2014. 57% were male. Male mean age was 72 (standard deviation [SD] =13.70), with a range of 40–95. Women were slightly older, with a mean age of 74 (SD =16.92) versus 72 (SD =13.70), (95% confidence interval [CI] - 69.79–75.55), and had a larger age range, 24–91. Overall, 58 patients (55%) presented with their respective ID cards. Twelve patients (11%) presented with a potentially device-related complaint. Of those 12, 8 (66%) presented with their respective ID cards. **Conclusion:** About half (55%) of CIED patients presented to the ED with their device ID cards. Even in the group of patients with potentially device-related complaints, only about 2/3 presented with their respective ID cards. The fact that this study was conducted at a single, Mid-Western site can make our results difficult to generalize, but we also identify a significant possible impediment to patient care that merits further research.

**The Effect of Time-Induced Stress on Cognitive Ability**

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**Background:** Time stress is common in emergency medicine. However, its effect on cognitive function is poorly described. Our purpose was to examine the performance of cognitive abilities as a function of time restraint. **Methods:** This was a prospective, randomized, interventional cohort evaluation. After signing informed consent, volunteers, blinded to the assignment, took a digital Cognitive Abilities Test (COGAT) with variable time availability to complete the test. Participants were required to answer 20 randomly selected verbal and quantitative COGAT questions from grade levels 10–12. Patients were given 8 min (1.5 standard deviations below the mean time for pilot investigators to complete the test), 13 min (the mean time by pilot test), and unlimited time. Participants were told how much time they had to complete the test and that they would get notified when they were halfway through. After COGAT completion, participants were debriefed and given the opportunity to withdraw their data. Power analysis (G * Power Software) using one-way between-group ANOVA, alpha of 0.05, and power of 0.8, required 60 patients to detect a clinically relevant effect with one independent variable (time) at three levels (8, 13, and unlimited minutes). **Results:** The total sample was 71 university aged participants consisting of 25.3% male, 71.8% female, and 1.4% transgender. In addition, race/ethnicity was 76.1% Caucasian, 9.9% African-American/Black, 2.8% Hispanic, 2.8% Asian, 1.4% Middle Eastern, 1.4 American Indian, and 5.6% Biracial, with $n = 23$, 23, and 25, in the 8, 13, and unlimited time groups, respectively. Mean (SD) correct score performance was 11.04 (3.05), 12.87 (2.83), and 12.88 (3.36) in the 8, 13, and unlimited groups, respectively. One-way ANOVA found no differences ($P = 0.073$) in scores among participants who had 8, 13, or unlimited minutes to complete the COGAT. **Conclusion:** Time pressure did not significantly affect cognitive ability.

**Pneumothorax as an Effect of Wasp (Hymenoptera) Sting Delayed Hypersensitivity**

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**Introduction:** Wasp venom-induced hypersensitivity and anaphylaxis presents as urticaria, angioedema, and potentially lethal manifestations such as bronchospasms and cardiovascular collapse. Pneumothorax has been reported as a rare occurrence with anaphylaxis as case records. Massive envenomation can lead to acute kidney injury, acute liver failure, intravascular hemolysis, rhabdomyolysis, disseminated intravascular coagulopathy, myocarditis, and myocardial infarction. **Case Description:** A 5-year-old, previously healthy child without known allergies, presented to local hospital after 12 h of the incident with >10 wasp stings. On admission, he was hemodynamically stable and found to have periportal edema and red-colored urine and was diagnosed with acute renal failure, metabolic acidosis, and coagulopathy. After 36–48 h of the injury, the child developed respiratory distress and chest X-ray revealed a right-sided pneumothorax. The child had neither rib fractures nor signs of external injury. Pneumothorax was subsequently managed with intercostal tube application. After transferring to ICU, liver failure was managed with N-acetylcysteine infusion; peritoneal dialysis was started for acute renal failure and high CPK levels; therapeutic plasma exchange started for raised LDH levels with evidence of microangiopathic hemolytic anemia on blood picture. **Conclusion:** Wasp venom contains chemical mediators of histamine, hyaluronidase, and phospholipase A. These may induce laryngeal edema as well as bronchospasms which can lead to pneumothorax. We conclude that pneumothorax should be differential diagnosis when a patient presents with severe shortness of breath following wasp sting. The sequence of multiorgan failure due to direct toxic effect should be carefully evaluated in the future studies.
Emergency Department Heart Failure Education Markedly Reduces Readmissions in Un- and Under-Insured Patients

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Background: Heart failure (HF) readmissions are a national health-care challenge for hospitals, providers, and patients. Our purpose was to evaluate the efficacy of a structured, educational intervention targeted toward under-insured ED HF patients. Methods: This prospective randomized open-label evaluation enrolled HF patients presenting to the ED for care from June to December 2015. Eligible patients gave informed consent, had a prior HF diagnosis, and were clinically stable. Intervention patients received a standardized educational intervention in the ED waiting room before being seen by the emergency physician. They also received a 30-day telephone follow-up. The primary and secondary end-points were 30- and 90-day ED and hospital readmission rates, as well as days alive and out of hospital (DAOH), respectively. Results: Of 94 patients entered, the median age was 58.4 years; 40.4% were female and 54.3% were African-American. At 30 and 90 days, education patients (n = 45) had a 47.8% and 45.3% decrease in ED revisits (P = 0.02 and P < 0.001) and 60.0% and 47.4% decrease in hospital readmissions (P = 0.049 and P = 0.007), respectively, postintervention. This compared to control patients (n = 49) who had no change in hospital readmissions or 30-day ED revisits, but experienced a 36.6% increase in 90-day ED revisits (P = 0.03). Education patients also saw a 59.2% improvement in DAOH versus control patients (P = 0.03). Conclusions: An ED educational intervention markedly decreases ED and hospital readmissions in un-and under-insured HF patients.

A single systemic injection of AAV9-hIGFBP2 prevents left ventricular hypertrophy and dysfunction in metabolic syndrome

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Background: Metabolic syndrome (MetS) is a known risk factor for cardiovascular events. It is characterized by central obesity plus any two of dyslipidemia, insulin resistance, and hypertension. Obese and diabetic patients with MetS have low plasma insulin-like growth factor binding protein 2 (IGFBP2).

Methods: Our first aim was to investigate IGFBP2 cardiac expression in MetS patients and in mice models of MetS. The second aim was to assess if gene therapy with adenovassociated virus 9 carrying human IGFBP2 (AAVhiGFBP2) could reduce MetS-associated left ventricular hypertrophy in mice. Results: We measured plasma IGFBP2 by ELISA and cardiac mRNA IGFBP2 expression in MetS patients by RT-qPCR. Both plasma levels and heart expression of IGFBP2 were decreased in patients with MetS versus controls. Further, in C57BL/6J mouse model of diet-induced MetS, we found similar left ventricular mRNA IGFBP2 expression. Finally, we demonstrated for the first time that in MetS mice with decreased cardiac IGFBP2 mRNA levels, human IGFBP2 can be induced by a single AAV9 IGFBP2, and that increased IGFBP2 prevents left ventricle wall thickening, hypertrophy, and dysfunction. Conclusions: Human plasma and cardiac IGFBP2 are decreased in MetS patients. In mice, restoration of cardiac IGFBP2 expression level prevents MetS-associated left ventricular dysfunction and hypertrophy. These clinical and animal data suggest that IGFBP2 is a new cardiac marker and the therapeutic target in MetS to prevent heart remodeling consistent with heart failure.

Major Bleeding among Rivaroxaban Users with Nonvalvular Atrial Fibrillation and Heart Failure

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Background: To describe the incidence of major bleeding (MB) and evaluate outcomes in heart failure (HF) patients receiving rivaroxaban for nonvalvular atrial fibrillation (NVAF). Methods: As part of an Food and Drug Administration postmarketing safety requirement, we queried over 10 million electronic medical records (EMRs) from the United States Department of Defense health-care system, from January 1, 2013 to June 30, 2015, to identify MB-related hospitalizations among rivaroxaban users (incident or prevalent) with NVAF. A validated case-finding algorithm was used for detection of MB, and the presence of HF was determined by evaluation of diagnosis codes in the EMRs. Incidence, outcomes, demographics, and comorbidities associated with MB were descriptively presented by HF status. Results: Of 44,793 NVAF patients on rivaroxaban, 20.7% had HF. Major bleeding rates were higher with HF than without, 5.33 (95% CI 4.88–5.82) versus 2.21 (95% CI 2.06–2.37) per 100 person-years. Of MB patients, mean (SD) age was similar for those with and without HF, 78.8 (7.4) versus 78.7 (8.1) years, although those HF had more hypertension (90.0 versus 85.8%), coronary artery disease (62.5 versus 44.7%), diabetes (45.3 versus 38.5%).
31.2%), prior ischemic stroke (9.2 versus 6.5%), and higher mean (SD) CHA<sub>2</sub>DS<sub>2</sub>-VASc scores [5.4 (1.4) vs. 4.1(1.4)], than those without HF. Fatal outcomes associated with MB were uncommon, but slightly higher with HF versus no HF, 0.12 (95% CI 0.07–0.22) versus 0.08 (95% CI 0.06–0.12) per 100 person-years, respectively. **Conclusion:** In a postmarketing study of 44,793 rivaroxaban users with nonvalvular AF, those with HF had more comorbidities and experienced higher rates of MB and fatal outcomes.

**Incidence of Major Bleeding in a Real-World Population of 57,070 Nonvalvular Atrial Fibrillation Patients Treated with Rivaroxaban**

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**Background:** Rivaroxaban, a direct factor Xa inhibitor approved in 2011, reduces the risk of stroke and systemic embolism in patients with nonvalvular atrial fibrillation (NVAF). Phase 3 results from the registration trial showed a major bleeding (MB) rate of 3.6/100 person-years. To evaluate MB incidence among NVAF patients taking rivaroxaban in a postapproval clinical setting. **Methods:** The US Department of Defense database electronic medical records for all beneficiaries (a population of nearly 10 million unique patients) were queried from the period of January 1, 2013 to June 30, 2016 to identify MB-related hospitalizations among rivaroxaban users with NVAF. Major bleeding was identified using the Cunningham algorithm <sup>1</sup>, a validated method which identifies MB through bleeding-related diagnosis codes on inpatient records. Major bleeding incidence, patient characteristics, comorbid conditions, concomitant medications, bleeding management, and fatal bleeds were assessed. **Results:** In this postmarketing study of 57,070 rivaroxaban users with NVAF, the MB incidence rate was 2.60 (95% CI 2.49–2.72)/100 person-years. There were 62 patients who experienced fatal bleeding and the mean (SD) age at time of death was 79.3 (7.6) years. Among those who died, 74.2% had intracranial hemorrhage, 22.6% had gastrointestinal hemorrhage, and 3.2% had bleeding in other sites. **Conclusions:** Patients with MB had more comorbidities and higher comorbidity scores as compared to patients without MB. The incidence of MB among rivaroxaban users with NVAF in this postapproval real-world setting was lower than the MB incidence in the clinical trial for rivaroxaban, 2.6 versus 3.6 per 100 person-years. Fatal bleeding was uncommon (0.08/100 person-years). The patterns of MB and fatal outcomes associated with MB in this diverse population of rivaroxaban users were generally consistent with the findings from the clinical trial for rivaroxaban.

**Stethoscope Cleaning Practices: The Dirty 3<sup>rd</sup> Hand of Modern Medicine**

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**Background:** Although the Centers for Disease Control (CDC) has published medical equipment sanitization guidelines to minimize infection transmission risk, studies of guideline compliance are mostly survey based. Since stethoscopes may serve as infectious vectors, our purpose was to perform an observational study of stethoscope sanitization practices in the clinical environment. **Methods:** This was an observational, anonymously obtained, cross-sectional study of patient-provider contacts to assesses the frequency, methods, and duration of stethoscope and hand disinfection practices by clinical staff. **Results:** Overall, stethoscopes were sanitized in only 18% of the 400 observed interactions and <4% of met the CDC guidelines. Hands were washed or sanitized before and after encounters only 27 times (6.8%). While hands were neither washed nor sanitized before or after 231 (58%) encounters, gloves were worn in 197 (85.3%) of these cases. Stethoscopes were not cleaned before any CDC-designated semi-critical patient examinations but were cleaned afterward 51% of the time. **Conclusions:** Stethoscopes are almost never cleaned as per the CDC guidelines. CDC compliant cleaning occurred in <4% of encounters, and stethoscopes were not cleaned at all in 82% of encounters. While hands were rarely cleaned (6.8%) as per the CDC guidelines, gloves were usually worn. Certainly, no convenient equivalent to the glove is available for stethoscopes; stethoscope hygiene must be addressed.