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Abstracts for the 37th Annual Emergencies in Medicine Conference

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Major Bleeding Rates in Nonvalvular Atrial Fibrillation Patients Treated with Rivaroxaban

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Background: Increasing age is associated with more comorbidity and higher congestive heart failure, hypertension, age ≥75 years, diabetes, stroke, vascular disease, age 65–74 years, and sex category (CHA2DS2-VASc) scores. The estimated stroke risk for patients with CHA2DS2-VASc scores of 1 to ≥4 is 1.3%–6.4% per year, respectively. Many older adults receive anticoagulant therapy for stroke prevention and may be at greater risk of bleeding when anticoagulants are used. This study aimed to evaluate the incidence of major bleeding (MB) by age group and CHA2DS2-VASc scores in patients taking rivaroxaban, a direct factor Xa inhibitor anticoagulant approved to reduce the risk of stroke and systemic embolism in patients with nonvalvular atrial fibrillation (NVAF). **Methods:** The United States 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 rivaroxaban users with NVAF. CHA2DS2-VASc scores were calculated for each patient. MB was identified using a validated case-finding algorithm that required, at minimum, one of a series of bleeding-related diagnosis codes within the primary diagnosis field on an inpatient hospitalization record. The incidence of MB was calculated by age group and by CHA2DS2-VASc score and presented per 100 person-years. Fatal bleeding was considered if the patient died during the MB hospitalization. **Results:** 1914 of 57,070 patients experienced MB. Bleeding rates increased with CHA2DS2-VASc scores. Gastrointestinal bleeding was the most common bleed site across all groups, followed by intracranial hemorrhage (ICH), 85.1% and 8.7% of MB events, respectively. Those <65 years with a CHA2SD2-VASc score of ≥4 had the highest rate of ICH, 0.57 (95% confidence interval [CI] 0.18–1.77) per 100 person-years. Fatal MB was uncommon, the highest rate was in those 85+ years old and with CHA2SD2VASc scores of ≥4, a rate of 0.15 (95% CI 0.09–0.25) per 100 person-years. **Conclusion:** The rate of MB in rivaroxaban users treated for stroke prevention increases as CHA2DS2-VASc score increases, though the risk and impact of MB may not exceed the risk of stroke. Those <65 years with higher CHA2DS2-VASc scores had the highest rate of MB, though patients over age 85 experienced higher rates of fatal MB.

Keywords: Atrial fibrillation, major bleed, nonvalvular, rivaroxaban, stroke

Predicting Postconcussive Symptoms in Computed Tomography-Negative Mild Traumatic Brain Injury

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Background: Mild traumatic brain injury (mTBI) is a global public health concern, with some patients developing chronic debilitating symptoms and long-term dysfunction. Over 90% of mTBI patients do not show trauma-related abnormalities on cranial computed tomography (CT). To determine which patients are at greater risk for postconcussive syndrome (PCS) at 3 months, models were constructed using objective blood biomarker results and bedside clinical symptoms. **Methods:** Patients with informed consent and enrolled in HeadSMART, a prospective study at Johns Hopkins University, had CT imaging performed through the American College of Emergency Physicians' eligibility guidelines. From 500 mTBI patients, 387 CT negative patients were identified and compared with noninjured healthy controls. Eight blood biomarkers were measured on mTBI patients using high sensitivity enzyme-linked immunosorbent assays. Among CT-negative patients, 3-month PCS outcomes were compared using machine learning models. Models were fit in RStudio version 1.0.136 (The R Foundation for Statistical Computing, Vienna, Austria), and were compared by sensitivity, positive and negative predictive values, accuracy and other measures. Using a threshold specificity level of (85%), risk models were identified including 3 or 4 blood biomarkers and 3–5 clinical features, ranked by the highest diagnostic odds ratios (DORs) and net reclassification index (NRI). **Results:** The evaluation of functional outcomes at 3 months using the Rivermead Postconcussive Symptoms Questionnaire showed that 35% of patients had PCS (>3 symptoms rated 2–4). Between healthy females and males, only Neuron-Specific Enolase (NSE) showed a significant increase, found in males. Combining Neurogranin, Metallothionein 3, NSE and Synuclein Beta, with the presence or absence of 3–4 clinical features indicated a higher risk of persistent PCS in CT negative mTBI patients, with associated DORs up to 7.0, and NRIs of up to 17.6%, compared to symptom-based bedside assessment alone. **Conclusion:** Objective biomarker tests, combined with clinically obtainable bedside symptoms, can be used to risk stratify mTBI patients without abnormal CT findings. Stratifying patients with these models may allow clinicians to determine increased risk profiles in mTBI patients, supporting clinical decision-making for more effective referrals to therapeutic interventions that are currently available.

Keywords: Biomarker, concussion, mild traumatic brain injury

Furoscix® Real-World Evaluation for Decreasing Hospital Admissions in Heart Failure

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Background: As many as 90% of patients presenting to the Emergency Department (ED) with worsening heart failure (HF) are admitted to the hospital, and some have suggested that 50% of hospital admissions for HF admitted from the ED could be avoided. The purpose was to evaluate 30-day differences in health-care resource utilization and direct medical costs for patients treated with the Furoscix Infusor outside the hospital versus patients receiving intravenous furosemide for ≤72 h in the hospital setting. **Methods:** This adaptive clinical trial will include a prospective treatment arm administered outside the hospital that will be compared to a propensity-matched historical control arm consisting of patients admitted to the hospital for ≤72 h. The control arm will be generated from administrative claims data. Furoscix will be administered daily through the Furoscix Infusor, whereby 80 mg is administered subcutaneously over 5 h. The number of days and doses of the initial therapy will be determined by the investigator based on an estimated volume of diuresis desired to shift the patient back to their oral diuretic maintenance therapy. The main components of the Furoscix Infusor include novel formulation, disposable cartilage, and reusable activator. The primary endpoint is the difference in the total cost of care between subjects treated with the Furoscix Infusor through 30 days postdischarge from the ED versus controls treated in the hospital for ≤72 h through 30 days postdischarge. The secondary endpoints include the number of hospital admissions, ED and clinic visits and duration within 30 days postdischarge from the ED, Kansas City cardiomyopathy questionnaire, and change in brain natriuretic peptide or N-terminal prohormone of brain natriuretic peptide (for Furoscix Infusor arm only). Adverse and serious adverse events will be monitored and described. **Results:** The study will begin enrollment in 2019, with results expected in 2020. **Conclusion:** The study will provide real-world evidence and quantify the impact on health-care costs by managing patients with worsening HF with the Furoscix Infusor outside the hospital.

Keywords: Cost, furosemide, heart failure, hospital admission

Injury Patterns and Emergency Medical Services Events in an Urban National Park Environment from 2010 to 2017

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Background: There are over 279 million annual visitors to areas controlled by the National Park Service (NPS). The National Capital Region (NCR) of the NPS is a unique, high-volume (57 million annual visits) visitation region consisting of an urban/park interface. The NCR contains 13 parks within the Washington, DC/Maryland/Virginia area. We sought to describe the epidemiology of injuries and medical events within the NCR and compare patterns to national and remote area statistics. **Methods:** Retrospective review of the NCR's electronic charting system from 2010 to 2017. We categorized outcomes, demographics, and complaints. Descriptive statistics were calculated with Microsoft Excel. Data were compared to a review of NPS visits from 2007 to

2011, showing that the NPS averaged 45.9 medical events per 1 million visitors annually, with medical, traumatic, and first aid events composing 29%, 28%, and 43% of reports, respectively. **Results:** For 2010–2017, the NCR reported 1921 Emergency Medical Services (EMS) events (33.7 events per million visits). There were 1702 categorizable complaints composed of 822 (49.2%) medical, 671 (40.2%) traumatic, and 178 (10.7%) first-aid events. Specifically, there were 587 (34%) medical/noncardiac arrests, 536 (31%) minor traumas, 226 (13%) environmental exposures (191 heat related), 178 (10%) first aid events, 132 (7.8%) major traumas, 9 (0.5%) medical/cardiac arrests, 3 (0.2%) traumatic arrests, and 31 (1.8%) nonmedical events. 463 (24.2%) events resulted in EMS transport. Patients were 62.4% female, 28.1% pediatric, 54.7% adult, and 17.2% geriatric. 909 (47.3%) events occurred in summer, while 492 (25.6%) events occurred in spring, 349 (18.2%) events occurred in winter, and 171 (8.9%) events occurred in fall. 1082 (56.3%) events were related to a mass gathering. 1735 (90%) events occurred at the National Mall and Memorial Parks which hosts the mass gathering events. **Conclusion:** The NCR represents an urban environment within the NPS. EMS event volume is driven by the National Mall and Memorial Parks in Washington, DC. Most events came from accessible mass gatherings. There is an increased proportion of medical calls compared to national and rural data. Incidences of environmental illness are similar to national data but with a higher proportion of heat illness. These variations are of ongoing importance to regional and national park planners.

Keywords: Emergency medical services, epidemiology, national capital region, national parks service

Delays in Key Clinical Workflow Steps in Thrombolytic Administration for Acute Ischemic Stroke

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Background: Acute Ischemic Stroke (AIS) is the leading cause of disability and the fifth-leading cause of death in the United States. Intravenous recombinant tissue plasminogen activator (tPA) as a treatment for AIS has a Class I, Group A level of evidence recommendation from the American Heart Association/American Stroke Association guidelines. The therapeutic benefit of tPA is proven but extremely time-dependent. Our purpose was to identify factors affecting door-to-needle (DTN) time of administration of tPA in the treatment of AIS. **Methods:** We conducted a retrospective chart review of patients presenting to an inner-city county emergency department from June 2010 to May 2013. Inclusion criteria were the presentation of AIS and administration of tPA within 4.5 h of symptom onset. Exclusion criteria included strokes of nonischemic origin and tPA administration beyond 4.5 h. A multivariate linear regression model was used to quantify the influence of demographic and clinical factors on DTN, and a multiple logistic regression model was used to analyze the effect of delay of individually timed benchmarks on the likelihood of DTN time being delayed. **Results:** Of 71 patients meeting our inclusion and exclusion criteria, 34 (48%) received tPA within ≤60 min. This patient population was 49% male, had a mean age of 56 (standard deviation) years, and was 48% Hispanic, 35% African-American, 13% Caucasian, and 4% other race. Female sex and non-emergency medical services (EMS) transport was associated with a DTN delay of 18.7 (95% confidence interval [CI], 3.4–34; $P = 0.02$), and 27.9 min (95% CI, 8.0–47.9; $P = 0.01$), respectively. Delays in any two of the following increased the probability of DTN time delay >60 min: Complete blood count (CBC) and prothrombin time/international normalized ratio/partial thromboplastin time (PT/INR/PTT) results becoming available in electronic medical record (EMR) (odds ratio [OR], 7.17; 95% CI, 1.17–48.90; $P = 0.03$); and order for tPA administration being made (OR, 6.75; 95% CI, 1.26–44.70; $P = 0.03$). **Conclusion:** We found that the female sex and non-EMS method of arrival are associated with increased DTN time, and the probability of delayed DTN time is increased by delays in two individual tPA administration workflow benchmarks: CBC, PT/INR/PTT results becoming available in EMR, and tPA being ordered.

Crack Cocaine Induced Upper Airway Injury

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Objectives: The aim is to describe the presentation and management of patients presenting with crack cocaine-induced upper airway injury. **Methods:** Retrospective clinical series at the Detroit Medical Center ranging from January 2011 to November 2015. **Results:** All patients with crack cocaine-induced thermal injury presented with mouth or throat pain plus at least one other laryngeal symptom, such as globus sensation, dysphagia, or throat tightness. All patients underwent flexible laryngoscopy; the supraglottis was the most common subsite of endolaryngeal injury (67%). The only statistically significant finding was the number of subsites on physical examination and flexible laryngoscopy and airway intervention ($P = 0.001$). Steroid medical therapy was started on all patients during the observation period. Airway intervention was required in one patient (17%), whereas the remaining patients were closely observed until resolution of symptoms. Eighty-three percent had resolution of symptoms and were discharged within 24 h. **Conclusion:** Upper airway injury should be suspected in patients who present with pain and laryngeal symptoms after smoking crack cocaine. After proper evaluation, conservative management with a steroid and close observation is the first line; however, airway intervention is required in a subset of these patients.

Keywords: Airway, burn, crack cocaine, flexible laryngoscopy

The T2Bacteria Assay is a Sensitive and Rapid Detector of Bacteremia that can be Initiated in the Emergency Department and has Potential to Favorably Influence Subsequent Therapy

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Background: Bacteremia is a major societal burden and treatment is challenged by a species-dependent response to antibiotics. The T2Bacteria Panel is a Food and Drug Administration-cleared and culture-independent assay for the detection of bacteremia due to the most common ESKAPE pathogens: *Escherichia coli*, *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*, and provides identification in about 4 h directly from blood. However, there are limited data describing how the assay could affect patient care by the emergency department (ED). **Methods:** ED patients from Louisiana and a Florida center were enrolled as part of the T2Bacteria Panel clinical study, which was prospective and noninterventional. Blood draws for blood culture (BC) and T2Bacteria were matched in time and anatomic location. We defined potential favorable impact on patient care from the positive T2Bacteria panel results. **Results:** Data from 137 ED patients were evaluated. Relative to BC, T2Bacteria showed 100% positive percent agreement (12/12) and 99.2% negative percent agreement (124/125). In addition, for species on the T2Bacteria Panel, the T2Bacteria assay detected 4 (25%) more positives associated with infection. The average time to identification was 56.6 h faster than BC. The T2Bacteria assay covered 70.5% of all species detected by BC. Finally, review of the 16 patients' records revealed, relative to actual care, the T2Bacteria assay could have potentially focused therapy in 8 patients, reduced time to a species directed therapy in 4 patients, and reduced time to effective therapy in 4 patients. **Conclusion:** In this ED population, the T2Bacteria assay was a rapid and sensitive detector of bacteremia from the most common ESKAPE pathogens (*E. coli*, *E. faecium*, *S. aureus*, *K. pneumoniae*, and *P. aeruginosa*) and showed the theoretical potential to influence subsequent patient therapy, ranging from antibiotic de-escalation to faster time to effective therapy.

Keywords: Bactermia, blood assay, bood culture, early detection

Wireless Vital Signs Monitoring Improves Patient Satisfaction in the Emergency Department

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Background: Patient satisfaction is an important indicator used to assess patient outcomes, patient retention, and reimbursement claims. Wired vital-sign monitoring equipment limit patient mobility and have a direct impact on the patient's overall hospital experience. Wireless continuous monitoring of a patient's vitals through the Vios Monitoring System (VMS, Vios Medical, St. Paul, MN, USA) provides a light, flexible way to deploy continuous wireless monitoring in hospitals. This study aims to assess the patient satisfaction and preference of the VMS. **Methods:** This is a pilot study conducted in an inner-city, academic county hospital. Patients ≥18 years of age and identified by the clinical nurse to benefit from continuous vital signs monitoring were eligible for enrollment. **Exclusions:** Burns, trauma, or pregnancy. After informed consent, a Vios sensor was placed on the patient's chest by a trained nurse. Patients and nurses completed a questionnaire using a 5-point scale (strongly agree, agree, neutral, disagree, and strongly disagree) for VMS versus standard of care to evaluate satisfaction with wireless monitoring. Descriptive statistics (95% confidence interval [CI]) were used to calculate the ratings. Incomplete ratings were ≤4% of the total data collected. **Results:** Of the 100 patients enrolled 50% were male, 35% African-American, 48% Hispanic, 11% Caucasian, and 6% others. The cohort was monitored for a total of 21,791 min (mean 218.7, standard deviation [SD] 124.50, 95% CI 193.97–243.37). The mean age of the population was 51.88 (SD 13.73) years. Fifty-eight nurses participated in the study with a total of 430 years (mean 7.54, SD 6.21, 95% CI 5.91–9.17) of clinical experience. We found that, when compared to the standard of care, 93% of the patients were more satisfied with the VMS, and 89% preferred the VMS. In addition, 94% enjoyed being able to move freely on the wireless system. **Conclusion:** The VMS is a novel wireless vital-sign monitoring system that improves patient satisfaction, is preferred over standard wired monitoring systems, and enables patients to move freely.

Keywords: Patient satisfaction, vital signs, vital-sign monitoring, wireless monitoring

Utility of an Application Assisted Communication for Emergency Medicine Physician Planning and Response to a Mass Casualty Incident

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Study Objectives: The aim is to investigate the use of a communication application (App) for both physician planning and response to a mass casualty incident (MCI). **Methods:** On September 30, 2016, faculty and fellows at an Academic, Level 1 trauma center acquired the App GroupMe to facilitate communication. As part of a readiness drill, they (29 faculty/fellows) were queried using the App 16 days before an event with high risk for MCI. They were asked for response time on the day of the scheduled event in: 60 min (A), 120 min (A) or "not at all" (N). Then, 4 days before the event, they were E-mailed response team assignments based on the availability and time of day. The App was used to communicate the need for physician backup at the beginning of the MCI. The pre-

MCI drill response rate, planned response teams, and actual responses were compared. **Results:** Drill: All 29 faculty/fellows responded using the App. 21 respondents reported available (A) and 8 were unavailable (N). E-mail responses confirming assigned response teams were provided by 22/29. Then, on the MCI day, physician back-up was requested using the App. 10 responded with immediate availability. Based on the response team assignment: 4 responded according to plan, 2 responded immediately despite reporting unavailable, 1 reported before planned arrival, 2 responded after nonresponse team placement, 1 reported early for later shift. During the MCI, 23 physicians utilized the App to communicate. There was a significant correlation between physicians who reported N during the drill and non-App users during the MCI ($P < 0.05$). **Conclusions:** Application-assisted communication was more effective than E-mail communication planning for a potential MCI. App communication used during an MCI was effective to recruit physician back-up. However, not all respondents did so according to the plan. Individuals reporting unavailability during a drill are unlikely to communicate via App during MCI.

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Nil.

Conflicts of interest

There are no conflicts of interest.