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Background: Advanced airways (e.g., endotracheal tubes, supraglottic airways) are frequently placed by Emergency Medical Services (EMS) in patients with out-of-hospital cardiac arrest (OHCA). However, the optimal timing of advanced airway placement during the sequence of resuscitation events is unknown. We hypothesized that earlier advanced airway placement would be associated with increased probability of return of spontaneous circulation (ROSC). Methods: This secondary analysis of ROC PRIMED study data included adult, non-traumatic, OHCA patients with advanced airway placement by EMS prior to ROSC. Patients were excluded if EMS witnessed the arrest or arrest time was unknown. The primary exposure variable was time from EMS arrival to advanced airway placement. The outcome variable was ROSC. A Cox proportional hazards model was constructed to estimate the probability of ROSC as a function of the time to advanced airway placement using non-linear penalized splines. The Cox model was stratified by initial cardiac rhythm, accounted for resuscitation duration, and adjusted for Utstein variables including age, sex, bystander interventions, and EMS response time. Patients were right censored at time of hospital arrival or EMS termination of resuscitation. Results: A total of 7,547 OHCA patients were evaluated. Mean age was 67 years (standard deviation 15), 69% were male, 38% had an initial shockable rhythm, and 49% received bystander CPR. Median EMS response time was 6 minutes (interquartile range 4–7). Time from EMS arrival to advanced airway placement was 0–5 minutes (12%), 5–10 (36%), 10–15 (29%), 15–20 (14%), 20–25 (5%), 25–30 (2%), and >30 (2%). Median time from EMS arrival to ROSC was 19 minutes (interquartile range 14–25). Time to advanced airway placement was significantly associated with ROSC based on the Cox model. For initial shockable rhythms, the probability of ROSC was 59%, 55%, 51%, 45%, 39%, and 33% with airway placement at 5, 10, 15, 20, 25, and 30 minutes, respectively. For non-shockable rhythms, the probability of ROSC was 43%, 40%, 35%, 30%, 25%, and 20% at the same airway intervals. Conclusions: EMS advanced airway placement for OHCA has a time-dependent association with ROSC. Early advanced airway placement is associated with increased ROSC, regardless of initial cardiac rhythm.

Background: The relationship between field termination resuscitation (FTOR) and survival from cardiac arrest is unknown. We hypothesized that EMS agencies with more frequent FTOR would be more likely to optimize resuscitative efforts on scene and would also have better patient outcomes. Methods: The Cardiac Arrest Registry to Enhance Survival (CARES) identified out-of-hospital cardiac arrests (OOHCAs) occurring from 2013 to 2016. A priori, EMS agencies were included if they submitted at least 80 cases during this period. Subsequently, agencies were divided into quartiles based on FTOR frequency. The top and bottom quartiles were identified as high (HFTAs) and low field termination agencies (LFTAs). Generalized estimating equation model was used to compare HFTAs and LFTAs. Results: Seventy agencies were classified as HFTAs (treating 31,486 OOHCAs patients) and 70 agencies were classified as LFTAs (treating 27,314 OOHCAs patients). FTOR was performed on 51.6% HFTA patients and on 7.1% of LFTA patients. The mean patient age was 62.1 years and 61.2% were male. HFTAs were more likely to have patients with a shockable rhythm (OR = 1.16, 95%CI 1.1–1.3, p = .003) and who received bystander CPR (OR = 1.52, 95%CI 1.3–1.7, p < .001) than LFTAs. HFTAs had higher proportions of ROSC (35.4% vs. 26.4%, OR = 1.38, 95%CI 1.2–1.6), survival to discharge (12.5% vs. 8.5%, OR = 1.46, 95%CI 1.3–1.7), and favorable neurologic outcome in survivors (86.7% vs. 77.9%, OR = 1.84, 95%CI 1.4–2.4) than LFTAs, all p < .001. These results remained significant after controlling for patient characteristics like age, shockable rhythm, and bystander CPR. Conclusions: The relationship between field termination resuscitation and survival is significant and may benefit by transport for care at a hospital.

Background: EMS professionals often undergo the difficult task of notifying families when a death occurs in the prehospital setting. However, many do not receive related training, which may exacerbate the associated stress. The emotional strain that accompanies death notifications has been linked to burnout in other healthcare settings, yet this has not been examined in EMS. Our objective was to assess the relationship between death notification and burnout among EMS professionals. We hypothesized that after controlling for training, delivering death notifications would be associated with higher odds of burnout. Methods: We analyzed data from a cross-sectional electronic survey administered in April 2017. A sample size calculation approximated that 1,300 responses were needed to make estimates with 95% confidence. Assuming an 11% response rate from previous work, we randomly selected 19,330 nationally-certified EMS professionals. Inclusion criteria consisted of EMTs or higher, practicing in non-military settings. We assessed burnout using the validated Copenhagen Burnout Inventory and providers self-reported training and the number of adult death notifications delivered in the past 12 months. We conducted multivariable logistic regression modelling using confounders selected a priori from previous research: certification level, experience, agency type, and call volume. We used the Hosmer-Lemeshow goodness-of-fit test to assess model calibration. Results: We received 2,333/19,330 responses (response rate:12.1%) and 1,514 (65%) met inclusion criteria. Over half (53%, n = 780) delivered at least one death notification in the past 12 months, while one-third (32%, n = 468) exhibited burnout. A stepwise increase in burnout prevalence was noted as number of death notifications increased. The prevalence of burnout was 23%, 36%, and 51% for those who delivered 0, 1–5, and 6 or more death notifications, respectively. After adjustment, delivering one or more death notifications was associated with 47% greater odds of burnout (OR:1.47, 95%CI:1.12–1.94). Meanwhile, training was associated with reduced odds of burnout (OR:0.60, 95%CI:0.47–0.77). Conclusions: After adjustment for
Background: Along with out-of-hospital cardiac arrest (OHCA), opioid abuse and overdose (OD) continue to present acute health problems in the US. While opioid-related deaths have increased in the US, recent temporal and regional trends in the proportion of OD as compared to non-OHCA are largely unknown and may impact treatment strategies and outcomes. Objective: To assess trends in incidence, process of care, and outcomes of OD-related to OHCA. Methods: A state-wide observational study utilizing an Ulstein-style database, along with detailed review of EMS reports with hospital records and vital statistics data between 2010 and 2015. The proportion and 95% Confidence Intervals were calculated to compare the rate of arrests between OD-OHCAs vs. C-OHCAs. Multivariate logistic regression was carried out to compare survival between the two groups. Results: There were a total of 21,658 confirmed OHCA’s during the study period. After excluding non-OHCAs/non-OD-OHCAs, 19,988 cases remained. Overall, 18,001 (94.8%) of arrests were C-OHCA and 987 (5.2%) were OD-OHCA. There was a significant increase in the proportion of OD-OHCAs between 2010, 4.6% (95% CI = 3.8–5.4) and 2015, 6.4% (95% CI = 5.7–7.3). Mean age for OD-OHCA, 70.5 years, was higher than C-OHCA, 64.2 years for C-OHCA (p < 0.0001). Overall survival to discharge in the OD-OHCA group was 18.6% vs. 21.1% in the C-OHCA group (p < 0.0001). Multivariable analysis revealed that bystander CPR was performed in 49.4% of OD-OHCAs vs. 48.3% of C-OHCAs (p = 0.29). Overall survival to discharge in the OD-OHCA group was 13.6% vs. 14.0% in the C-OHCA group (p < 0.0001). Conclusions: This statewide study found a significant upward trend in the proportion of OD-OHCA’s as well as differences in population demographics and epidemiology. Given the varying etiology, location, and age, it is surprising that the bystander CPR rates were nearly identical. It is likely that regional variations in OD-OHCAs exist and emergency medical systems should track data to optimize their prevention and resuscitation efforts.

6. Death by Suicide: The EMS Profession Compared to the General Public

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Background: EMS professionals face high levels of chronic physical/emotional stress and Post Traumatic Stress Disorder related to prehospital care. Suicide has been linked to other first responder professions, such as law enforcement, presumably related to multiple chronic stressors. While high-profile anecdotal EMS suicide cases and national survey data on suicidal ideation/ attempts have received much attention, there is a paucity of data on EMS suicide completions. We sought to determine the statewide proportionate mortality ratios (PMRs) for suicide attempts and completions among EMS professionals. Methods: A prospective study was performed at a high volume comprehensive stroke center. In the first phase, eight EMS agencies were educated on use of the RACE score. Any available RACE score. A RACE score of 5 or higher was able to identify 64% of all LVO cases, with multiple EMS agencies correlated with NIHSS score triggered early alert of the neurocath lab, potentially large vessel occlusion (LVO) stroke patients may lead to faster triage and treatment. We examined whether the Rapid Arterial Occlusion Evaluation (RACE) score can be reliably implemented in a real-world setting with multiple EMS agencies and its potential large vessel occlusion and reducing time to thrombectomy. Prehospital identification of potential large vessel occlusion (LVO) stroke patients may lead to faster triage and treatment. We examined whether the Rapid Arterial Occlusion Evaluation (RACE) score can be reliably implemented in a real-world setting with multiple EMS agencies and its potential large vessel occlusion and reducing time to thrombectomy. Prehospital identification of potential large vessel occlusion (LVO) stroke patients may lead to faster triage and treatment. We examined whether the Rapid Arterial Occlusion Evaluation (RACE) score can be reliably implemented in a real-world setting with multiple EMS agencies and its potential large vessel occlusion and reducing time to thrombectomy. Prehospital identification of potential large vessel occlusion (LVO) stroke patients may lead to faster triage and treatment. We examined whether the Rapid Arterial Occlusion Evaluation (RACE) score can be reliably implemented in a real-world setting with multiple EMS agencies and its potential large vessel occlusion and reducing time to thrombectomy.
successfully implemented across EMS agencies and results in faster to door to groin puncture times. While RACE scores of 5 or higher is associated with greater likelihood of LVO, there are a significant number of false positives. Further refinement of prehospital stroke severity scores was needed to improve the accuracy of this approach.

8. Effecting Neurologically-Intact Survival for Children with Out-of-Hospital Cardiac Arrest

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Category of Submission: Operations, Quality, Safety, Systems, Disaster

Background: EMS crews commonly limit on-scene care for pediatric out-of-hospital cardiac arrest (POHCA) patients, typically attempting to provide treatment while transporting. Hypothesis: Neurologically-intact survival for children can be improved by deferring transport and prioritizing on-site care using strategies that expedite on-scene drug delivery and intubation with tightly-controlled ventilation.

Methods: Data for all consecutive POHCA cases between January 1, 2012 and April 30, 2017 were prospectively (cumulative Ueinstein-style registry). In 2014, new training prioritized on-scene resuscitation strategies (Phase I) that expedited drug delivery and intubation with controlled ventilation (e.g., rates ~6/min). In 2016, techniques to dose/prepare drugs while responding were introduced (Phase II). Neuro-intact survival in Phase I (8/13, 62%) vs. pre-change (Phase II) were then compared to Phase I and II outcomes. Throughout the study, protocols followed the 2010 American Heart Association guidelines. No other on-scene modifications were made system-wise. The modified training included psychological and skills-enhancing tools to provide greater confidence in providing on-scene care.

Results: EMS crews managed 143 consecutive POHCA cases over the 5.33-year study period throughout which the majority of children continued to present in asystole, including those resuscitated. In resuscitated patients, the interval from vehicle arrival on-scene to the first epinephrine administration fell from 16.5 minutes (2012–2013) to 7.3 minutes (Phase I to II); in Phase II, 27% (10/37) of children received intubation and intravenous insertion in much greater frequency on-scene in Phase I and II with no other significant differences in terms of age, sex, etiology, response interval, or sequence of drug infusions. Rates of survival to hospital discharge with intact neurological status did improve immediately: 23.2% (13/56) in Phase I and 34.7% (17/49) in Phase II versus 16.5 minutes (2012–2013) to 7.3 minutes (Phase I to II); in Phase II, 27% (10/37) of children received intubation and intravenous insertion in much greater frequency on-scene in Phase I and II with no other significant differences in terms of age, sex, etiology, response interval, or sequence of drug infusions. Rates of survival to hospital discharge with intact neurological status did improve immediately: 23.2% (13/56) in Phase I and 34.7% (17/49) in Phase II versus 2 minutes for those resuscitated patients and 3.33 minutes for all patients. Conclusions: Although a historically-bad year for cardiac arrest, a Bonferroni adjustment for multiple comparisons was used to evaluate differences in reasons for leaving EMS between EMTs and paramedics. The traditional RR cut point had a +LR of 5.28 (95%CI 3.35–8.34). The age-specific RR cut point had a +LR of 6.10 (95%CI 3.54–10.00). EMS did not obtain RR in 16% and SBP in 28% of cases. Conclusions: The accuracy of the physiologic step of the FTDS is not improved by using age-specific criteria; the rate of under-triage is decreased while the rate of over-triage is increased.

10. Do Age Appropriate Vital Sign Cut Points Improve the Predictive Ability of the Physiologic Criteria of the Field Triage Decision Scheme for Identifying Children Who Need the Resources of a Trauma Center

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Background: Prior research found the Field Triage Decision Scheme’s (FTDS) physiologic step is a moderate predictor of pediatric trauma center (TC) need. Predictive ability could be hindered if pediatric patients were combined to TC candidates when defining abnormal vital signs. Our objective was to determine the accuracy of the FTDS physiologic step when traditional cut points are compared to age-specific cut points for identifying children needing TC resources.

Methods: A prospective study of all injured children ≤15 years, regardless of severity, transported to EMS and pediatric TC was conducted in three mid-sized cities. EMS providers were interviewed to obtain patient demographics and presence or absence of coma, cardiac arrest, and neuro-intact survivors. Children were considered to need a TC if they met a published consensus definition. Outcome data was obtained through structured hospital record review. The traditional RR cut points and positive likelihood ratios (+LR) were calculated using traditional and age-specific cut points for the physiologic step, as well as for systolic blood pressure (SBP) and respiratory rate (RR). Results: EMS and outcome data were available for 9,484 children. 2% of all patients needed the resources of a TC. 11% of patients met the physiologic criteria for leaving EMS and +LR cut points were used and 23% when age-specific cut points were used. Using the traditional physiologic criteria, 46% of children needing a TC would have been under-triaged and 10% over-triaged (+LR 5.44, 95%CI 4.75–6.24). Using the age-specific physiologic criteria, 40% would have been under-triaged and 22% would have been over-triaged (+LR 2.69, 95%CI 2.40–3.01). The traditional RR cut point had a +LR of 3.12 (95%CI 2.94–4.07). The age-specific RR cut point had a +LR of 1.86 (95%CI 1.50–2.32). The traditional SBP had a +LR of 5.28 (95%CI 3.35–8.34). The age-specific SBP had a +LR of 6.10 (95%CI 3.54–10.00). EMS did not obtain RR in 16% and SBP in 28% of cases. Conclusions: The accuracy of the physiologic step of the FTDS is not improved by using age-specific criteria. The rate of under-triage is decreased while the rate of over-triage is increased.

11. Comparative Effectiveness of Antiarrhythmic Drugs for Out-of-Hospital Cardiac Arrest: A Systematic Review and Network Meta-Analysis

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Category of Submission: Operations, Quality, Safety, Systems, Disaster, Payment, and Support

Background: The objective of this systematic review, direct pairwise meta-analysis and network meta-analysis (NMA) was to assess the use of antiarrhythmic drugs for patients experiencing out-of-hospital cardiac arrest (OHCA). Methods: Electronic searches of Medline, EMBASE, and Cochrane Central Register of Controlled Trials were conducted and reference lists were hand searched. Randomized controlled trials (RCTs) investigating the use of antiarrhythmic agents administered during resuscitation for adult (≥ 18 years) patients suffering non-traumatic OHCA were included. Two reviewers independently screened abstracts, assessed risk of bias of the included studies, and extracted data for the following outcomes: return of spontaneous circulation (ROSC), survival to hospital admission, survival to hospital discharge and survival to hospital discharge with good neurologic status. Direct and indirect evidence were combined in a NMA using a frequentist approach with fixed-effects models and reported as relative risks (RR) with 95% confidence intervals (CIs). For each pairwise comparison, the certainty of direct, indirect, and network evidence was assessed using the GRADE approach. Results: 8 RCTs involving 4,464 patients were combined to compare the effectiveness of five antiarrhythmic agents (amiodarone, bretylium, lidocaine, magnesium, and sotalol) and placebo administered during resuscitation for adult OHCA. For each pairwise comparison, direct evidence was associated with a statistically significant increase in ROSC compared to placebo (1.15; 95% CI: 1.03–1.28) and was also superior to bretylium (1.61; 95% CI: 1.00–2.60) for ROSC.
12. EMERGENCY MEDICAL SERVICES PROVIDER PERSPECTIVES ON PEDIATRIC CALLS: A QUALITATIVE STUDY

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Background: Previous survey results in our ambulance service indicate that 9-1-1 response to incidents involving children are particularly distressing for emergency medical services (EMS) clinicians. This qualitative study was conducted to increase understanding about the difficulties of responding to pediatric calls and obtain information about how organizations can better support EMS providers in managing potentially difficult calls.

Methods: Paramedics and emergency medical technicians from a single U.S. ambulance service were invited to participate in focus groups about responding to 9-1-1 calls involving pediatric patients. A total of 37 providers from both rural and metro service regions participated in six focus groups held in community meeting spaces. A semistructured focus group guide was used to explore: (1) elements that make pediatric calls difficult, (2) perspectives about follow-up resources, (3) type or nature of the call, (4) interactions with patients, (5) location/scenario challenges. With regard to pre-arrival preparation, participants often cited mentally reviewing, (3) type or nature of the call, (4) interactions with patients, and (5) location/scenario challenges. Participants were invited to pre-arrival preparation practices, (3) experiences with coping after difficult pediatric calls, and (4) perspectives about follow-up resources and how they help them de-escalate.

Results: Participants reported that pediatric calls difficult were organized into the following themes: (1) the social value of children, (2) clinical difficulty of pediatric calls, (3) type or nature of the call, (4) interactions with parents, and (5) location/scenario challenges. With regard to pre-arrival preparation, participants often cited mentally reviewing, (3) type or nature of the call, (4) interactions with patients, and (5) location/scenario challenges. With regard to pre-arrival preparation, participants often cited mentally reviewing.

Conclusions: The most debilitating aspect of pediatric calls is the prehospital setting. Hypertonic saline can be less effective than isotonic fluid in the prehospital setting. The comparison was isotonic fluid, which included normal saline, and near isotonic fluids such as Ringer’s Lactate.

Assessment of study quality was done using the Cochrane Collaborations’ risk of bias tool and a fixed effect meta-analysis was conducted to determine the pooled relative risk of survival to hospital discharge. Secondary outcomes were reported for fluid requirements, multi-organ failure, length of hospital stay, long term survival and disability.

Results: Of the 1,160 non-duplicate citations screened, 38 articles underwent full-text review, and five trials were included in the systematic review. All studies administered a fixed 250 mL dose of 7.5% hypertonic saline, except one that administered 300 mL. Two studies used normal saline, two Ringer’s Lactate, and one Ringer’s Acetate as control. Routine care co-interventions included isotonic fluids and colloids. Five studies were included in the meta-analysis (all trials had common patient characteristics) with minimal statistical heterogeneity (I2 = 0%). The pooled relative risk of survival to hospital discharge with hypertonic saline was 1.02 times that of isotonic fluid. For important clinical outcomes, 1.18 (95% CI: 1.08–1.30) and lidocaine (1.18; 95% CI: 1.08–1.30) were associated with statistically significant differences in secondary outcomes.

Conclusions: There was no significant difference in important clinical outcomes for hypertensive injured patients administered hypertonic saline compared to isotonic fluid in the prehospital setting. Hypertonic saline cannot be recommended for use in prehospital clinical practice for the management of hypertensive injured patients based on the available data.

15. PERFORMANCE CHARACTERISTICS OF THE MODIFIED RAPID ARTERIAL OCCLUSION EVALUATION SCALE (MRACE) TO PREDICT LARGE VESSEL OCCLUSION

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Background: Stroke is a leading cause of disability in the United States. The most debilitating strokes are caused by large vessel occlusion (LVO), and patient outcomes are improved through delivery of time-sensitive endovascular therapies at comprehensive stroke centers (CSC). The Rapid Arterial Occlusion Evaluation (RAO) scale can identify patients with LVO and facilitate triage to CSCs, with published sensitivity of 68% and specificity of 85% at score of ≥5. We aimed to demonstrate the implementation feasibility and performance of prehospital mRACE scale, which does not assume the laterality of aphasia and agnosia symptoms, to identify LVO. Methods: The mRACE scale was implemented in 12 EMS agencies, scoring both aphasia and agnosia regardless of laterality of symptoms to improve the ease of training and capture of atypical symptoms. Training consisted of a didactic presentation, video and hands-on demonstrations of patient scenarios. A step-by-step scoring guided paramedics through the exam. mRACE data were collected prospectively and documented.
upon completion of the prehospital electronic health record. A project coordinator obtained informed consent for those individuals transported to UPMC facilities. Analysis included descriptive statistics and performance characteristics (sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV)).

Results: From December 2015 to July 2017, a prehospital mRACE scale was completed for 780 patients with suspected stroke. Complete in-hospital data were available for 517 (66%). Of these, 186 had a mRACE scale of ≥5. There were 188 (36%), CI 32–40% cases with final diagnosis of ischemic stroke of which 65 (12.6%) CI 10–16%) had LVO. This yielded 75.3% (CI 72–79%) sensitivity, 68.6% (CI 65–73%) specificity, 56.3% (CI 45–67%) PPV, and 83.8% (CI 75–90%) NPV with a ROC AUC of 0.85 (p < 0.005).

Conclusion: Implementing the prehospital mRACE scale to identify patients with LVO is feasible and performs similarly to the RACE scale without distress to patients. Further research is necessary to determine if implementation of the mRACE scale leads to increased interventions for patients with LVO and subsequent decreased mortality.

16. EFFECTS OF FAILED DEFIBRILLATION ATTEMPTS ON WAVEFORM CHARACTERISTICS OF THE ELECTROCARDIOGRAM

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Background: The morphology of the electrocardiogram (ECG) of the ventricular fibrillation (VF) waveform during cardiac arrest can be quantified using signal analysis (QECG). Studies have shown that QECG measures may be predictive of defibrillation success. We sought to quantify the effect of failed rescue shocks on the QECG values for patients with VF in out-of-hospital cardiac arrest (OHCA). We considered a failed shock to be one in which the ECG rhythm was VF prior to and after the shock. We hypothesized that failed rescue shocks would lead to changes in QECG (measures). Methods: Electronic defibrillator data were taken from non-traumatic, EMS-treated OHCA cases from the Resuscitation Outcomes Consortium (ROC) Collaborative (10.9%). Complete QECG data (vs. 100% linkage). Of 141,114 analyses included two-sided t-test or chi-square with alpha ≤ 0.05. Results: A total of 239,554 EMS events resulted in 159,807 patient transports; 141,114 were analyzed for failure after duplicate removal (89.1% linkage). Of 141,114 patients, 4,269 died (3.0%; 95%CI 2.9%, 3.1%). There were 4,269 in the ED (17.0%), and 3,545/4,269 died as in-patients (83.0%). The proportion of overall mortality by MPDS determinants was Male (26.4%), Delta (3.9%), Charlie (3.4%), Bravo (1.1%), and Omega (1.1%). For adults the mean age of survivors was less than non-survivors (59.2 vs. 75.8; p < 0.001), but pediatric survivors were older than non-survivors (p < 0.001). Males had increased mortality (3.3%) compared to females (2.8%; p < 0.001). Mortality did not change by day of week (p = 0.573), but did by season with the highest ED mortality in the winter (p = 0.004). The highest overall mortality occurred with patients presenting between 0600–1200 hours (5.9%), and the lowest between 0000–0600 hours (2.3%; p < 0.001). The MPDS cards with the highest overall mortality were 9-cardiac/respiratory arrest (34.4%), 33-interfacility transfers (7.1%), 6-breathing problems (5.8%), and 28-stroke/traumatic ischemic attack (4.3%). The highest overall mortality for paramedic clinical impressions were cardiac arrest (76.4%), respiratory arrest (18.0%), hypotension/shock (11.4%), hypoperfusion/cardiac arrest/paralysis (10.9%). The ED diagnoses with the highest overall mortality were related to neoplasms (19.8%), circulatory system (12.4%), respiratory system (7.7%), and infections (6.0%). Conclusions: Significant in-hospital mortality differences were found between event, patient, and clinical characteristics. These data provide important foundational and hypothesis generating knowledge regarding mortality in transported EM patients that can be used to guide research and training.

18. EPIDEMIOLOGY OF INFECTIONS AND SEPSIS IN A LARGE CANADIAN EMERGENCY MEDICAL SERVICES (EMS)

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Background: Sepsis is a life-threatening syndrome caused by a dysregulated immune response to infection. Early recognition and intervention are critical to improve patient outcomes. In many regions, paramedics often encounter patients with sepsis before other clinicians, offering an important opportunity for earlier sepsis care. The purpose of this study was to describe characteristics of EMS patients with sepsis and to examine characteristics of patients with infections, and sepsis transported by paramedics.

Methods: A one-year cohort of all adults (> = 18 years) transported by a BLS/ALS EMS system serving a rural/urban population of approximately 2 million was linked to in-hospital administrative databases (emergency department and inpatient). Infection, and sepsis cases were classified based on ED infectious disease diagnosis code, and an existing sepsis algorithm based on ED diagnosis codes and EMS clinical information. Clinical characteristics including age (years), Glasgow Coma Score (GCS) (< 15, tachypnea (/> 22/minute), and fever (/> 37.8 Celsius), and the operational factors (transport time (minutes), transport distance from municipality to hospital, and high-priority Medical Priority Dispatch System (MPDS) determinant (Echo/Delta) were evaluated in adults (/> = 18 years) and compared to patients not meeting sepsis criteria. Two sided t-test or difference of proportion were used with statistical significance < 0.05. A 1,174 unique adult encounters were successfully linked to in-hospital databases (89% linkage rate). The one-year incidence of infections, and sepsis were 11% and 2.1%, respectively. The mortality of all patients with infections presented with fever (18%), abnormal GCS (22%) or tachypnea (32%). Compared to other patients, adults with sepsis were more likely to have an abnormal GCS (60% vs. 16%, p < 0.001), tachypnea (48% vs. 20%, p < 0.001), or fever (25% vs. 4%, p < 0.001). They were generally older (mean vs. 75 years, p < 0.001) and more likely to have a high priority MPDS determinant (38% vs. 31%, p < 0.001). Sepsis patients had longer prehospital times (mean 17 minutes, p = 0.001) despite shorter transport distances (15.93 vs. 16.9 km/miles, p = 0.004). The in-hospital mortality rate for patients with infection was 8% (95%CI 5–12%) and for sepsis (95% CI, 18–21). Conclusions: Infections and sepsis are common among paramedic-transported patients, and paramedics spend a considerable time with these patients prior to arriving in the ED. These patients frequently have altered vital signs, suggesting earlier recognition may be feasible. The in-hospital mortality of these patients is significant, supporting the need for further research into opportunities for prehospital identification and intervention.

19. COMBINED PREHOSPITAL HYPOXIA-HYPOPTERMIA “DEPTH-DURATION DOSE” AND MORTALITY IN MAJOR TRAUMATIC BRAIN INJURY

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Background: Our previous work has shown that the depth-duration doses of prehospital hypoxia (SpO2 < 90%) and hypothermia (SBP < 90 mmHg), separately, are strongly associated with mortality in Traumatic Brain Injury (TBI). However, hypoxia and hypotension are
obviously not mutually exclusive. Hence, the next logical step in evaluating the influence of the 'multidisciplinary' nature of TBI care lies in TBI is to identify the combined risk. 

Methods: We evaluated major TBI cases (moderate/severe) enrolled in the EPIC Study (NIH-R01HL070140) before TBI guideline implementation (N = 16,711; 1/07-9/14). Definitions: hypoxia dose-SpO2 depth < 90% integrated over time (min); hypotension dose-SBp < 90 mmHg integrated over time. Both dose variables were then transformed to achieve approximate normality. Logistic regression was used to determine the association between the dose variables and the primary outcomes. 

Results: After exclusions (age < 40; SBP ≥ 100 mmHg), 144 patients remained (mean age = 20 ± 10 years; 20% female). Mortality increased according to the dose. Hypoxia dose (OR 3.57; 95% CI 1.25-10.00) and hypotension dose (OR 2.67; 95% CI 1.22-5.82) were independently associated with increased mortality. The effect of hypotension was stronger (OR 6.38; 95% CI 2.34-17.31) when compared to hypoxia (OR 2.25; 95% CI 0.80-6.41). 

Conclusions: Both hypoxia and hypotension, measured as dose variables modified by the adjusted dose score, are significantly associated with increased mortality. Future research should focus on the development of a score to predict mortality in TBI patients.
retrospective observational study using prehospital ambulance vital signs to calculate qSOFA score for all emergency medical services patients transported to the hospital in Fresno, CA. From the electronic health record (EHR) we used to identify the presence of prehospital vital signs and sepsis, hospital admission, ICU admission, and in-hospital mortality. Results: A total of 1,903 adult medical patients were transported by ambulance to the emergency department during the study period. Of these, 151 patients (7.93%) were prehospital qSOFA positive. A positive prehospital qSOFA score was correlated with emergency department diagnosis of infection (29.1% vs. 15.2%; p < 0.001), hospital admission (55.0% vs. 33.4%; p < 0.001), ICU admission (9.93% vs. 2.22%; p < 0.001), and an-hospital mortality (6.62% vs. 0.74%; p < 0.001). A positive prehospital qSOFA score was not associated with up-triage (7.95% vs. 5.29%; p = 0.291), but it was correlated with final triage to a high acuity zone in the emergency department (35.8% vs. 8.96%; p < 0.001). Conclusions: Prehospital qSOFA score correlated with the diagnosis of infection and sepsis. Furthermore, it is correlated with poorer patient outcomes including need for hospital admission, ICU admission, and in-hospital mortality. However, a positive prehospital qSOFA score in isolation does not appear to be more useful than the current triage process in the emergency department to identify patients who are triaged to a high acuity zone in the absence of other patient factors.

24. PREHOSPITAL PROVIDER ATTITUDES AND BELIEFS REGARDING PEDIATRIC SEIZURE MANAGEMENT: A MULTICENTER, QUALITATIVE STUDY

John Carey, Jonathan Studnek, Lorin Browne, Malcolm Leirmoe, Daniel Ostermayer, Tyler Miller, Diaa Alquisair, Thomas Bowey, Stephanie Schroter, E. Brooke Lerner, Manish Shah, Baylor College of Medicine, Pediatrics, Section of Emergency Medicine Category of Submission: PEDIATRICS

Background: Seizures have the potential to cause significant morbidity and mortality and are a common reason EMS are requested for a child. A pediatric prehospital seizure evidence-based guideline (EBG) was published and implemented as part of multiple EMS systems. Knowledge translation and protocol adherence in medicine can be incomplete. In EMS, systems-based factors and providers’ attitudes and beliefs may contribute to incomplete knowledge translation. The purpose of this study was to identify EMS provider-reported attitudes, beliefs, barriers, and enablers to adhering to EBG-derived seizure protocols in multiple EMS systems. Methods: This was a qualitative study utilizing 30-minute semi-structured interviews of paramedics who recently transported actively seizing 0–17 year olds in two different urban EMS systems. Interviewers explored the providers’ decision-making during their recent case and regarding seizures in general. Two investigators used NVivo software, the grounded theory approach, and constant comparison to independently analyze the interviews. Discrepancies were resolved through discussion until thematic saturation was reached. Results: Several overarching themes emerged from the 32 interviews. Enablers included dosing/protocol references, training, provider knowledge about preferred routes, predefined provider roles, options to use different medical control, belief that seizures are a medical emergency, and frequent exposure to seizures. Barriers included equipment availability, controlled substance management, inefficient training, few pediatric calls, unclear definition of a treatable seizure and conglomerate protocol and reference tool dosing. Personal barriers included fear of respiratory depression, confusion about dosing, and misconceptions about preferred routes. Febrile seizure management, and accurate methods of weight estimation. Paramedics provided other opinions about management: prehospital administration of a thrombopeptid complex, how transport distance affects medication, how transport distance affects management, use of online medical control, and the need to manage bystanders. Providers suggested improvements to address equipment, medication, protocol, and training limitations. Conclusions: Paramedics identified many standardized strategies EMS systems used that enabled pediatric seizure protocol adherence, as well as numerous systems-based and personal barriers to adherence. Providers identified solutions to address the barriers. Conducting research on EMS protocol changes, policy modifications, and training that address the barriers identified in this study may enhance understanding of how to optimize prehospital seizure outcomes.

25. ANALYSIS OF DOING ERRORS MADE BY PARAMEDICS DURING SIMULATED PEDIATRIC PATIENT SCENARIOS AFTER IMPLEMENTATION OF STATE-WIDE PEDIATRIC DRUG DOSING REFERENCE

John Hoyle, Glenn Ekblad, Tracy Hover, Bill Fales, Richard Lammers, Dena Smith, Western Michigan University, Homer Stryker, MD School of Medicine Category of Submission: PEDIATRICS

Background: Medication errors occur at a high rate for prehospital pediatric patients. Epinephrine dose errors have been 60%. To reduce errors, Michigan implemented a pediatric dosing reference (PDR), with doses listed in milliliters, the requirement that doses be drawn into a smaller syringe from a pre-loaded syringe using a stop cock and dilution of drugs to standard concentrations. The purpose of this study was to evaluate the prevalence of medication errors by paramedics treating pediatric patients after the implementation of a state-wide Pediatric Drug Dosing Reference (PDR). Methods: Eleven pediatric scenarios were completed 2 validated pediatric scenarios: infant seizures and infant cardiac arrest. Agencies were private, public, not for profit, for profit, urban, rural, and suburban. Simulations took place in a simulation center or mobile simulation unit. EMS crews used their regular equipment with sham drugs and were required to carry out the steps to administer a drug dose. Two evaluators scored crew performance via direct observation and video review. A dose error was defined as: n = 20% difference compared to the weight-appropriate dose. Descriptive statistics were utilized. Results: 80 simulations have been completed and initial analysis has been conducted using descriptive statistics. The majority of crews were EMTP/EMTP. In cardiac arrest scenarios, 8/20 (40%; 95% CI 18.5%, 61.5%) epinephrine doses were incorrect. In 0/20 doses, there was no cross check of the drug volume prior to administration. There were 6, ten-fold overdoses and one, ten-fold underdose. In seizure scenarios, 5/11 (45%; 95% CI 16%, 74.9%) benzodiazepine doses were incorrect (2 underdoses, 3 overdoses); 2/9 (22%; 95% CI 0%, 49.4%) drug dilutions were incorrect resulting in large dosing errors. In 1/10 (10%) of the cases the crew was unable to dilute D50 to D25. Unrecognized air bubbles were frequently entrained in the administration syringe resulting in underdoses. In 31% of cases (95% CI: 10%, 52%) the crew made an error using the length-based tape for weight determination. Conclusions: Epinephrine dose errors have decreased since implementation of PDR, but frequent ten-fold errors still occur. Cross checking of drug doses with PDR is associated with dilution and length-based tape use. Error reduction strategies are needed for pediatric prehospital drug administration.

26. TRAINING IN PREHOSPITAL DEATH NOTIFICATIONS LINKED TO IMPROVED PROVIDER COMFORT AND PREPARATION

Abraham Campos, Rebecca Cash, Remle Crowe, Madison River, Brian Clemency, Robert Swor, Ashish Panchal, Erin Gertz, Department of Emergency Medicine, University of Nebraska Medical Center Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Death notifications in the prehospital setting are difficult situations that require training. However, this training is not uniformly included in initial EMS education, and the proportion of providers prepared for this task is unknown. Our objective was to describe the prevalence of death notification training by provider level and its association with preparation and comfort in performing this task. We hypothesized that providers who received training and that training was associated with greater preparation and comfort. Methods: An electronic questionnaire was sent to a random sample of 20,000 EMS professionals in April 2017. Participants reported death notification training received during initial or continuing education and adult death notifications performed in the past 12 months. Level of comfort and preparation in delivering adult death notifications was rated using a 4-point scale. Inclusion criteria were practicing, non-military, EMS or higher. Certification level was grouped into advanced life support (ALS: paramedic/intermediate/AEMT) or basic life support (BLS:EMT). Odds ratios (OR), 95% CI, p-value were calculated to estimate the association between training and provider comfort and preparation. Results: There were 2,333 responses (12% response rate), and 1,514(65%) met inclusion criteria. Most respondents had performed at least one adult death notification in the past year (ALS: 87%, BLS: 78%; p < 0.001). Equal proportions of ALS and BLS (51% versus 49%, p = 0.43) providers had received death notification training during an initial course, however fewer BLS respondents received additional training (BLS: 30% versus ALS: 44%; p < 0.001). A larger proportion of BLS respondents did not receive any death notification training (BLS: 40%, ALS: 32%; p = 0.005). Over one-third (34%) of those without training had performed an adult death notification in the past year. After controlling for certification level, training was associated with increased odds of reporting greater comfort (2.20, 1.77–2.75, p < 0.001) and preparation (6.05, 4.73–7.74, p < 0.001) performing death notifications. Conclusions: Most respondents delivered a death notification in the past year; however, one-third of these EMS providers had not received death notification training during an initial course, which was associated with greater comfort and preparation in delivering death notifications. Limitations include recall bias attributed to self-report. Future work should focus on barriers to receiving death notification training.

27. REDUCTION IN CERVICAL SPINE IMMobilIZATION IS NOT ASSOCIATED WITH MISSED INJURIES

Jennifer Gibson Chambers, Michael O’Brien, Brian Clemency, University at Buffalo Category of Submission: Student, Resident, Fellow

Background: Previous studies have demonstrated EMS providers can correctly determine which patients have spine injuries and patients arriving at the emergency
Cervical spine injuries in patients transported without cervical collars. Methods: This was a secondary analysis of a retrospective chart review of patients transported by a single large, commercial EMS agency with a dispatch protocol for motor vehicle collision to one of three hospitals. EMS and hospital data were reviewed for a 3-month period after a revised protocol was implemented (January–June 2015) and a 6-month period after (January–June 2016) the protocol change. Fisher exact test was used for statistical comparisons between time periods. Cervical spine injuries identified on CT were considered serious if the patient required operative intervention, discharge in an immobilization collar or cervical spine injuries present in patients who died as a result of traumatic injuries. Results: There were 1,614 patient records identified, 819 under 16 years of age. Of these, 1,081 (66.8%) were male patients, with an average age of 34.4 years. No significant difference between time periods was observed in proportion of male patients, average age, or mechanism of injury. No significant change was observed in the rate of CT cervical spine imaging (51.0% before and 52.5% after, p = 0.25). Serious cervical spine injuries were identified in 2.2% before and 2.4% of images patient records after SMR (p = 0.99). All patients with serious cervical spine injury were place in cervical collars by EMS providers, a sensitivity of 100%. The specificity was 14.0% before and 18.7% after SMR (p = 0.10). Conclusions: Despite decreased use of cervical collars under the SMR protocol, there were no motor vehicle accident patients with serious cervical fractures transported without a cervical collar in either period. These findings may not generalize to other mechanisms of injury.


Background: Measuring and improving organizational safety culture has been linked to positive safety outcomes in EMS, yet few evaluation tools exist for this unique setting. The Agency for Healthcare Research and Quality’s (AHRQ) Surveys on Patient Safety Culture (SOPS) are widely used to assess safety culture in various healthcare settings and results are included in a national comparative database to allow for benchmarking; however, there is no SOPS instrument specific for EMS. Our objective was to evaluate the psychometric properties of an EMS-adapted tool based on existing SOPS domains. We hypothesized that the reliability and validity of the EMS tool would be similar to existing SOPS instruments. Methods: We administered a 37-item instrument adapting 10 domains from the SOPS instruments and one new domain capturing the unique aspect of communication while enroute to a call. We administered an electronic survey to all 332,584 nationally-certified EMS professionals. Analysis inclusion criteria for the final study population included higher than the mean number of responses in non-military settings. We evaluated domain structure using confirmatory factor analysis (CFA) using a polychoric correlation matrix for ordinal data. We used prior SOPS thresholds to assess acceptable fit (0.90) and factor variances (0.5). We assessed domain reliability and validity using Cronbach’s alpha (cutoff:0.6) and Pearson’s correlation coefficients (cutoff:0.3). Results: We finally split 23,765 responses into equally-sized calibration and validation datasets. The CFA supported the 11-domain model with a comparative fit index = 0.94 (0.90 if factoring the LC model index), item factor loadings all exceeded 0.4 (range: 0.51–0.98). Three domains exhibited factor variances below the 0.5 threshold: staffing, communication, and handoffs. Cronbach’s alpha was above 0.6 for all domains (range:0.65–0.88). Predictive validity was supported as all domain composite scores were correlated with the outcome variables of overall safety rating (r = 0.40–0.72) and frequency of event reporting (r = 0.31–0.48). Results from the validation dataset confirmed the presented calibration results. Conclusions: Overall, the EMS-adapted tool demonstrated adequate psychometric properties, and the reliability and validity of the tool were consistent with existing SOPS instruments. Instant limitations include potential response bias and the inadequacy to aggregate data at the agency level. Future work should focus on agency-level data testing.


We conducted a prospective survey of all EMS provider interviews in a 5 cm, 14-gauge needle for pneumothorax...
decompression. High-risk complications can arise if utilizing an inappropriate needle size. New findings utilizing appropriate needle length in pediatric patients. Utilizing computed tomography (CT), we determined the needle length required to access the pleural cavity in children matched to Broselow Pediatric Emergency Tape color. Methods: Three investigators reviewed chest CTs of children < 13 years of age obtained between 2010-2015. Patient exclusions included those with congenital anomalies, muscle disease, pectus deformity, anasarca, prior open thoracotomy, inadequate imaging, or missing height documentation. We established four groups based upon Broselow color as determined by chest wall thickness at four points: right/left second intercostal space at the midclavicular line (ICS-MCL) and right/left fourth intercostal space in the anterior axillary line (ICS-AAL). Our outcome was chest wall thickness and interquartile ranges (IQR) for each Broselow group and anatomic site. Results: To date, 225 chest CTs have been reviewed. Median (interquartile range) age and weight were 11.5 years (10.5-13.0 years) and 31.5 kg (26.3-36.1 kg) female. Children measuring Broselow Blue/Orange (≤68 cm), had a median chest wall thickness at the right ICS-MCL of 1.5 cm (IQR 1.3 cm, 1.5 cm), left ICS-MCL 1.6 cm (IQR 1.5 cm, 2.0 cm), right ICS-AAL 1.7 cm (IQR 1.5 cm, 1.9 cm), left ICS-AAL 1.6 cm (IQR 1.4 cm, 2.2 cm). Children measuring Broselow Red/Purple (68.1-90 cm): right ICS-MCL 1.6 cm (IQR 1.5 cm, 1.9 cm), left ICS-MCL 2.1 cm (IQR 1.7 cm, 2.1 cm), right ICS-AAL 1.8 cm (IQR 1.6 cm, 2.2 cm), left ICS-AAL 1.6 cm (IQR 1.3 cm, 2.0 cm), Children measuring Broselow Gray/Pink (90.1-115 cm): right ICS-MCL 2.1 cm (IQR 1.5 cm, 2.3 cm), left ICS-MCL 1.9 cm (IQR 1.6 cm, 2.3 cm), right ICS-AAL 1.8 cm (IQR 1.7 cm, 2.1 cm), left ICS-AAL 1.7 cm (IQR 1.5 cm, 2.1 cm). Children measuring Broselow Blue/Orange/Green (>115.1 cm): right ICS-MCL 2.4 cm (IQR 2.1 cm, 2.9 cm), left ICS-MCL 2.4 cm (IQR 2.1 cm, 2.9 cm), right ICS-AAL 2.1 cm (IQR 1.7 cm, 2.9 cm), left ICS-AAL 2.1 cm (IQR 1.6 cm, 2.9 cm). Conclusions: Median chest wall thickness varied by Broselow color in children ≤13 years of age. The standard 5-cm needle is twice the chest wall thickness of most children.

32. DESCRIPTIVE ANALYSIS OF DEFIBRILLATION VECTOR CHANGE FOR PREHOSPITAL REFRACTORY VENTRICULAR FIBRILLATION

Matthew Davis, Andrew Schappert, Jay Loosley, Kristine VanAarsen, Shelley McLeod, Sheldon Cheskes, Department of Medicine, Division of Emergency Medicine, Western University CATEGORY OF SUBMISSION: Cardiac Background: Patients in ventricular fibrillation (VF) who do not respond to standard Advanced Cardiac Life Support treatments are deemed to be in refractory VF (rVF). The ideal prehospital treatment for patients with rVF represents a double sequential external defibrillation (DSED) has been proposed as a viable option for patients in rVF. Although the mechanism by which DSED terminates rVF remains unknown, one theory is that the change in defibrillation vector that occurs may contribute. Our objective was to describe clinical outcomes in patients presenting with rVF during out-of-hospital cardiac arrest (OHCA) for those who underwent vector change defibrillation, compared to those who received standard treatment. Methods: This was a retrospective review of adult (≥18 years) patients presenting in rVF during OHCA over 15 months beginning in March 2016. Patients who underwent vector change defibrillation had a change in pad position (anterior-anterior to anterior-posterior) after 3 or more consecutive shocks. Termination of rVF was defined as the absence of VF after a vector change or standard defibrillation during the next rhythm analysis. Results: There were 372 OHCA, with 25 (6.7%) patients presenting in rVF. Of these, 16 (64.0%) patients (median age 62 years, 81.3% male) had vector change after a median (IQR) of 3 (3.0-4.0) paramedic defibrillation attempts. Median (IQR) for vector change defibrillation was 8.8 (7.1–11.1) minutes. Eight (50%) patients had termination of rVF after the first vector change shock, 6 (37.5%) had prehospital return of spontaneous circulation (ROSC) and 5 (31.3%) patients survived to hospital discharge. Of the 9 rVF patients who did not have vector change, median age was 63 years and 88.9% were male. The median (IQR) number of defibrillations within this group was 5 (4.5-7.0). All patients remained in VF after the fourth defibrillation. Prehospital ROSC was achieved in 3 (33.3%) patients. Three patients (33.3%) survived to hospital discharge. Conclusions: This is preliminary evidence that vector change defibrillation in patients with rVF may result in VF termination during controlled CPR. Our trial is warranted to test whether or not vector change has a role in the termination of rVF.

33. BENCHMARKING EMS COMPASS STROKE PERFORMANCE MEASURES USING A LARGE NATIONAL DATASET

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nudell, Williamson County EMS CATEGORY OF SUBMISSION: Operations, Quality, Safety, Systems, Disaster Background: Prehospital stroke alerts have been promoted as a means of facilitating rapid ED treatment of acute strokes. These alerts are dependent upon the performance of validated stroke screening in the ED. Screening of blood glucose to eliminate a common stroke mimic. EMS Compass has identified several performance measures on this topic. No work has been done to calculate a national performance benchmark for these measures. These benchmarks would be useful in system improvement efforts. We sought to describe national performance on these measures for the first time.

Methods: Using anonymous data from 9-1-1 consenting agencies in a large commercial EMS electronic health record (EHR) Solutions, we identified records to have acute strokes who were transported from the scene of a 9-1-1 call. From these records, we calculated the proportion of all patients who had a stroke scale documented. For each of these measures, we also calculated the 95% confidence interval. Results: Of a 6 1/2-year period, we identified 168,854 patients with 9-1-1 calls who had an impression of acute stroke. Of these, 88,751 patients or 52.6% (52.3-52.8%) had a stroke scale documented. Additionally, 140,294 patients, or 83.1% (82.9-83.3%) had a blood glucose documented. Conclusions: In this prospective randomize clinical trial, instructor’s objective real-time feedback resulted in improved overall CPR quality.

34. EFFECT OF INSTRUCTOR’S REAL-TIME FEEDBACK DURING LAYPERSON CARDIOPULMONARY RESUSCITATION TRAINING ON QUALITY OF CPR PERFORMANCES: A PROSPECTIVE CLUSTER RANDOMIZED TRIAL

So Yeong Kang, Sang Do Shin, Kyoun Jun Song, Tae Han Kim, Gwan Jin Park. Department of Emergency Medicine, Inje University Hospital CATEGORY OF SUBMISSION: Cardiac Background: It was reported most bystander CPR does not meet high quality CPR criteria, strongly implying an urgent need for new strategies to assist in the delivery of quality bystander CPR. The aim of this randomized trial was to assess the effectiveness of instructor’s real-time, objective feedback during CPR training compared to conventional feedback in terms of trainee’s CPR quality. Methods: We performed a cluster randomized trial of community CPR training at Nowon District Health Center in Seoul. CPR training classes were randomized into either intervention (instructor’s objective real-time feedback based on Laerdal QCPR Classroom) or control (conventional feedback) group. Laerdal QCPR Classroom software is a real-time feedback device, which monitors quality of real-time CPR performances of multiple trainees simultaneously. During each training session, trainees performed a total of five CPR. The primary outcome was the total score, which is an overall measure of chest compression quality. Generalized linear mixed models were used to analyze the outcome data from baseline to fifth CPR session, accounting for both cluster- and individual-level covariates. Results: A total of 77 training sessions were randomized into 37 intervention (996 trainees) and 40 control (898 trainees) groups. At baseline, both groups had equal overall CPR quality scores (76 in both groups). During the course of the training, QCPR feedback significantly increased trainees’ overall quality of CPR performance compared with conventional feedback (p < 0.001). This was statistically significant difference between the two groups was observed for changes in compression depth from baseline to fifth CPR session with a mean change of 4.51 mm in the intervention group and 2.72 mm in the control group (p < 0.001). Conclusions: Considering the rate of chest compression, we did not observe a statistically significant different between two groups (p = 0.06). In this prospective trial, instructor’s objective real-time feedback resulted in improved overall CPR quality.

35. CONFIRMING THE SAFETY AND FEASIBILITY OF A BUNDLED RESUSCITATION TECHNIQUE INVOLVING A HEAD-UP/ TORSO-UP MECHANICAL CHEST COMPRESSION TECHNIQUE FOR CARDIOPULMONARY RESUSCITATION

Paul Pepe, Kenneth Schepke, Peter Antevy, Daniel Millstone, Charles Coyle, Craig Prousansky, Sebastian Garay, Johanna Moore, University of Texas Southwestern Medical Center CATEGORY OF SUBMISSION: Operations, Quality, Safety, Systems, Disaster Background: Strategies to lower intracranial pressure (ICP) and improve cerebral/systemic perfusion during CPR have become a recent focus for resuscitation researchers. One experimental method to lower ICP has been to elevate the head and chest during CPR combined with the use of devices to enhance venous return to the thorax. The purpose of this study was to evaluate both the safety and clinical feasibility of such a modified chest compression technique. Methods: The EMS system catchment (pop. 1.4 million) is geographically expansive with broad ethnic...
diversity, extremes of age and socioeconomic characteristics of urban settings. Of the 201 emergency medical services cases attended between January 1, 2015 and March 31, 2015, quarterly (all-cause) survival rates remained constant (mean 17.8%), ranging from 13% to 22% overall during the transition phase with an ensuing sustained doubling (35.18%; range 30–40%) for the next two years (July 1, 2015 through June 30, 2017). Further, the 24% increase in EMS resuscitation rates in 2016 and 2017 were found to be an “improvement” and not a drift (p = 0.405), holding and manipulating device (9.13 vs. 8.75 p = 0.593), holding and manipulating device (9.13 vs. 8.75 p = 0.593), holding and manipulating device (9.13 vs. 8.75 p = 0.593)

Results: The purpose of this study was to determine rates of prenotification in a large urban setting among patients who were resuscitated with the diagnosis of having had an acute stroke and to determine factors associated with appropriate prenotification. Methods: This was a retrospective cohort study of all patients who were resuscitated with the diagnosis of CVA, TIA or intracranial hemorrhage who arrived by EMS between January 1 and December 31, 2015 at three urban hospitals. Participants were transferred from the emergency medical services (EMS) to the hospital emergency department or hospital admission. “Get with the Guidelines” data was matched to data from the prehospital care reports. Appropriate prehospital notification was defined by the EMS narrative or hospital record to advanced notification of the patient’s arrival. Logistic regressions were used to determine factors that may have been important for EMS prenotification and whether prenotification was associated with higher rates of tPA administration. Analysis was done using the R-statistical computing software. Results: During the study period, 379 patients presented via EMS; 126 arrived within 3.5 hours of their last known normal (LKN). EMS suspected a CVA in 107 (85%). Prenotification was given in 52 of these cases (44%) and the Cincinnati Prehospital Stroke Scale (CPSS), prenotification was 24% higher in patients with slurred speech (p = 0.01), 24% higher with arm drift (p = 0.01), and 20% higher with facial droop (p = 0.04). In a multivariate logistic regression including the three components of the CPSS, slurred speech was the most important factor for prenotification (p = 0.09), followed by arm drift (p = 0.14), and facial droop (p = 0.56). With appropriate prenotification, there was a 47% increase in the number of patients receiving tPA (p = 0.06). Conclusions: Prehospital providers are not consistently providing prenotification. In our cohort, EMS prenotification the ED in patients with more severe and recent onset symptoms. Similar to other studies showing improved time interval metrics with prenotification, our study suggests that prenotification was associated with higher rates of tPA administration. There may be a benefit to dedicating resources toward EMSS education on the role of prenotification in the stroke chain of survival.

39. Interaction Effects of Communities and Advanced Airway Management on Survival after Out-of-Hospital Cardiac Arrest; Multi-Level Analysis

Dongsun Choi, So Yeon Kong, Tae Han Kim, Jeong Ho Park, Kyoung Jun Song, Young Sun Ro, Ki Ok Ahn, Sang Do Shin, Seoul National University Hospital, Department of Emergency Medicine Category of Submission: CARDIAC

Background: Chest compression and adequate ventilation are essential for oxygen delivery in out-of-hospital cardiac arrest (OHCA) cases. The association between prehospital advanced airway management (AAM) and survival outcomes is inconsistent. We hypothesized that differences in the application of prehospital AAM between regions due to medical resource would have an effect on the effectiveness of the AAM. The aim of this study was to investigate whether the effect of prehospital AAM on outcomes between regional EMS systems of four Asian cities. Methods: We used a PARCS (Pan-asia resuscitation outcome study) registry. We identified patients with OHCA and presumed cardiac etiology who were resuscitated by emergency medical services in four Asian cities between 2012 and 2014. OHCA patients were witnessed by EMS personnel and age
under 18 years were excluded. The main exposure variables were AAM. The primary end-point was survival with adequate ventilation volume (38.5% p = 0.35–0.52) and 0.17 (0.38–0.58), respectively. The interaction model for the survival discharge, the neurologic recovery was better in the non-AAM group (8.7% vs. 5.1%, 4.9% vs. 2.0%) than in the AAM group (adjusted odds ratio [AOR] 0.58 [95% confidence interval (CI) 0.59–0.68]). The interaction model for the survival discharge, the AORs for AAM of Osaka and Singapore was 0.43 (95% CI 0.35–0.52) and 0.31 (0.17–0.58), respectively. The interaction model for the survival discharge, the values showed for neurologic recovery. Conclusions: Regional EMS system modified the effect of AAM on outcomes for patients with OHCA.

40. RAPID CYCLE DELIBERATE PRACTICE AND COACHING OF SPECIFIC INTERVENTIONS IMPROVE CARDIOPULMONARY RESUSCITATION QUALITY MEASURES IN TEAMS OF EMS PROVIDERS

Christopher Berry, Pamela Humphrey, Anthony Halupa, Stephen Taylor, Jarrett Shugars, Douglas Kupas, Geisinger Health System Category of Submission: CARDIAC

Background: High-quality cardiopulmonary resuscitation (CPR) is paramount for good survival from cardiac arrest, but previous studies have suggested that CPR quality is often poor. The purpose of this study was to evaluate changes in the quality of EMS provider CPR skills using rapid cycle deliberate practice (RCDP) of specific teaching interventions with real-time feedback. Methods: A recording mannequin (SimMan3000) feedback blinded from providers who also had previous CPR education and certification. CPR quality metrics were assessed, before and after educational interventions, using a 5-minute resuscitation case simulating a prehospital cardiac arrest with ventricular fibrillation. The intervention included using coaching and RCDP to teach techniques of palm lift, two-person two-thumbs-up bag-mask ventilation, uninterrupted ventilation during continuous compressions, and chest compressions during defibrillator charging. CPR metrics included: compression fraction, compression rate, percentage of compressions with full depth, full recoll, percentage of compressions between 100–120 per minute, ventilation rate, percentage of first breaths with end-tidal carbon dioxide and longest of pauses. Outcomes were compared through paired samples t-tests using bias-corrected bootstrapping, resampling 1000 times with 95% confidence intervals. Results: The sample consisted of 67 providers divided into 18 teams. There were significant improvements for the following metrics of CPR quality when comparing coached and post-intervention measures: percentage of compressions between 100–120 per minute (39.5% vs. 78.5%; p = .001, n2 = 0.60), compression fraction (78.8 vs. 92.3; p = 0.01, n2 = 0.39) with full recoll (52.7% vs. 85.6%; p = 0.01, n2 = 0.60), percentage of adequate ventilation volume (38.5% vs. 57.4%; p = 0.02, n2 = 0.55), and longest pause in compressions (16.6 sec vs. 6.2 sec; p = 0.004, n2 = 0.48). Conclusions: The use of RCDP and coaching with real-time mannequin feedback led to significant improvements in measures of CPR quality in teams of EMS providers.

41. INFLUENCE OF PATIENT RACE ON ADMINISTRATION OF ANALGESIA BY STUDENT PARAMEDICS

Bill Lord, Sahaj Khalsa, University of the Sunshine Coast Category of Submission: PROFESSIONAL

Background: Disparities in healthcare are associated with factors that include social status, and race or ethnicity, with evidence showing that African American individuals receive fewer procedures and treatments as compared to white individuals. Disparities in the management of pain have been shown to be associated with race. However, there is limited data regarding the influence of race on analgesia provided by paramedics. As such, this study aims to investigate associations between patient race and student paramedic management of pain, using a null hypothesis of no difference. Methods: This retrospective cohort study used a contiguous dataset of all student paramedic records entered in the Skill Tracker database between January 1, 2014 to December 31, 2015. Cases were extracted if aged 16 to 100 years, the patient was present and the primary or secondary impression was trauma (abdominal, chest, extremity, neck-back, multi) or burns. Head injury was excluded as this is a contraindication to analgesia in some settings. The primary outcome of interest was the interaction between patient race and student paramedic administration of any analgesia for cases meeting inclusion criteria. Secondary outcomes of interest were associations between race and gender and analgesia administration. The adjusted logged odds of patients receiving any analgesic was tested with binomial logistic regression using a stepped modeling approach. Results: A total of 59,962 cases were available for analysis; median age was 50 years (IQR 39 years), 50.2% were female (n = 30,077). The most common cause of trauma was fall, representing 50% (n = 26,053) of cases. 14.1% of patients received any analgesia (n = 8,425). Caucasian patients have significantly higher logged odds of analgesia than non-Caucasian patients (p < 0.001). When analgesia administration is adjusted for age category and gender, African Americans have the lowest logged odds of any analgesia when compared to Caucasian patients (OR 0.65, p < 0.001). Conclusions: The results indicate inequality in the provision of analgesia by student paramedics based on patient race. This suggests a need for education that addresses cognitive and affective biases that can affect clinical judgements, and EMS audit of cases to identify disparities in care based on race.

42. PARAMEDES PROVIDING PALLIATIVE CARE AT HOME: PATIENT AND FAMILY SATISFACTION

Alix Carter, Judah Goldstein, Marianne Arab, Michelle Belchime, Robert H. Stewart, Mireille Lecours, Carolyn Villard, James Sullivan, Dalhousie University Category of Submission: OPERATIONS, QUALITY, SAFETY, SYSTEMS, DISASTER

Background: Paramedic crisis and symptom management is an essential component of palliative care with the goal to treat in place to represent a novel approach to care. A new clinical practice guideline, additional medications, and a revised palliative care model of care. Approach to Palliative Care (LEAP) Mini for Paramedics were implemented in two provincial EMS systems. Our objective was to determine if there was a significant change in patient/family satisfaction and to describe their experience with paramedic palliative support at home. Methods: The experience of paramedics/patients/families in the paramedic palliative care registry in Nova Scotia and PEI was gathered in a mixed methods approach from June 1, 2016 to August 31, 2016. Upon enrollment in the registry, participants were mailed. Six months after an episode of care (allowing for grieving time) a semi-structured telephone interview using a validated guide was conducted. Overall satisfaction was measured using a 5-point Likert scale. Respondent characteristics are reported descriptively. Open-ended questions were analyzed by the lead investigator. Results: A total of 225 registration surveys were distributed, 67 (30%) were returned. Of those, 49 (73%) were completed by the family. For the interviews, families were contact sequentially (8 declined, 23 disconnected phones, 32 unanswered calls with two call attempts). Eighteen families completed the interview. Three themes emerged from the pre-encounter survey: registering meant fulfilling loved one’s care wishes, providing peace of mind, and feeling prepared for emergencies. Post-encounter, 14/18 families rated the encounter “satisfactory,” and all indicated that symptoms were helped. Seven families indicated that without the program, they would have had to be in hospital. Five themes emerged from the survey: professionalism of paramedics, compassion of paramedics, relief of symptoms, and a plea for program continuation. Thematic saturation was reached with minor modifications. Conclusions: The model of paramedics providing palliative support in the home resulted in high patient/family satisfaction; registering in the program, prior to any call for assistance, provides peace of mind and a feeling of being prepared. Families particularly note the value of 24/7 availability and an end to relief of symptoms, and the degree of compassion and professionalism of paramedics.

43. AMPLITUDE SPECTRUM AREA CHANGES DURING CARDIOPULMONARY RESUSCITATION AFTER DIFFERENT DURATIONS OF UNTREATED CARDIAC ARREST IN A PORCINE MODEL OF VENTRICULAR FIBRILLATION (VF): A PROSPECTIVE OBSERVATIONAL STUDY OF CONCURRENT ACUTE MYOCARDIAL INFARCTION

Giuseppe Ristagno, Francesca Fumagalli, Weilun Quan, Giovanni Babini, Roberto Latini, Yongqin Li, IRCCS-Instituto di Ricerche Farmacologiche Mario Negri, Milan, Italy Category of Submission: CARDIAC

Background: Amplitude spectrum area (MSA) is a predictor of successful defibrillation during CPR on AMSA in relationship with the duration of untreated ventricular fibrillation (VF) in a prospective observational study with concurrent acute myocardial infarction. Methods: An established model of myocardial infarction followed by VF was used. Forty-four pigs were subjected to different VF durations: 8–10 minutes (short), n = 14; 12 minutes (intermediate), n = 21; and 15 minutes (long), n = 9. Continuous mechanical CPR (Lucas, PhysioControl) with ventilation with oxygen and epinephrine administration (1 mg at 2 minutes of CPR) was performed for 5 minutes prior to a single shock using the automated external defibrillator. Approach to Palliative Care (LEAP) Mini for Paramedics were implemented in two provincial EMS systems. Our objective was to determine if there was a significant change in patient/family satisfaction and to describe

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While numerous implementation barriers are of methods in different contexts (e.g., urban hospitals and regulatory agencies). The study implementation (e.g., financial constraints, low(24, 59%), or implementation barriers (e.g., 2001.67, 11.3)). While untreated VF (dAMSA: 10.7 ± 0.8 vs. 3.6 ± 0.6 mVHz, p < 0.01), Interestingly, dAMSA improved similarly in the 3 VF duration groups during the first 2 minutes of CPR, but after epinephrine the magnitude of dAMSA continued to increase only when the duration of CPR was longer than 3 minutes, while it decreased for shorter durations. Conclusion: High quality CPR allowed for AMSA increases independently of the duration of untreated VF. However, it did not improve dAMSA only in the instance of longer durations of VF, while it seemed to have a detrimental effect for a shorter duration.

44. PREHOSPITAL EVIDENCE-BASED GUIDELINE IMPLEMENTATION METHODOLOGY: A SYSTEMATIC LITERATURE REVIEW

Jennifer Fishe, Remle Crowe, Rebecca Cash, Nikiah Nudell, Christian Martin-Gill, Charles Young, Michelle Gauvreau, COM Jacksonville, Department of Emergency Medicine Category of Submission: OPERATIONS, QUALITY, SAFETY, SYSTEMS, DISASTER

Background: As prehospital research advances, evidence-based guidelines (EBGs) are increasingly implemented into EMS practice. However, incomplete EBG implementation may hinder improvement in prehospital patient outcomes. To inform future EBG efforts, this study reviews and summarizes existing evidence pertaining to prehospital EBG implementation methodologies. Methods: This study is a systematic literature review followed by the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology, PubMed®, EMBASE®, Scopus®, and Google Advanced SearchTM were searched without language or publication date filters. Studies were selected if they were related to measures, methods, or results of EBG implementation. The review was completed by three of five members of the Prehospital Guidelines Consortium. Results: No Measure was excluded. GRADE was applied to remaining articles independently by three of five members of the Prehospital Guidelines Consortium. Ratings in each GRADE category were resolved by consensus. Study characteristics and salient findings are reported. Results: The systematic literature review produced 1,375 articles, with 41 meeting inclusion criteria. Most articles described EBG implementation (N = 24, 59%), or implementation barriers (N = 13, 32%). Common study designs were statement documents (N = 12, 29%), retrospective cohort studies (N = 12, 29%), and cross-sectional studies (N = 9, 22%). Using GRADE, evidence quality was rated low (N = 18, 44%), or very low (N = 3, 7%). Findings included: (1) EBG adherence and patient outcomes depend upon successful implementation; (2) published studies generally lack detailed implementation methods; (3) implementation takes longer than planned (mostly for EMS education); (4) EMS systems’ heterogeneity affects implementation, and (5) multiple barriers limit successful EBG implementation (e.g., financial constraints, equipment purchasing, coordination with hospitals and regulatory agencies). The study found no direct evidence for best prehospital EBG implementation practices, including comparisons of implementation methods, or of methods in different contexts (e.g., urban versus rural, ALS versus BLS). Conclusion: While numerous implementation barriers are well described, there is a paucity of evidence for optimal prehospital EBG implementation methods. Given the importance of reaching prehospital patients, future prospective studies should compare implementation methodologies in different prehospital contexts. EBG project sponsors should develop the implementation methods, with “lessons learned” compiled in an easily accessible repository. Funding priorities should include implementation research to enhance prehospital EBG development translate into practice.

45. ARE THERE DISPARITIES IN DISPATCH CPR INSTRUCTION RECEIPT AND CPR PERFORMANCE?

Amanda Amen, Patrick Karabon, Brian McNally, Cherie Bartram, Kevin Irwin, Kimberly Vellano, Robert Swor, Oakland University William Beaumont School of Medicine Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Dispatch-assisted cardiopulmonary resuscitation (DA-CPR) has been shown to improve rates of bystander CPR (BCPR), which enhances survival in Out of Hospital Cardiac Arrest (OHCA). Our objectives are to evaluate whether there are racial and socioeconomic disparities in the receipt of DA-CPR instructions and subsequent CPR performance. Methods: We performed a retrospective review of the Cardiac Arrest Registry to Enhance Survival (CARES) dispatch registry from January 2014 to December 2016. Data was collected from a convenience sample of dispatch agency supervisor audits of 9-1-1 OHCA audio recordings in one state. Elements related to dispatcher CPR instruction, and barriers to bystander CPR performance were recorded. Demographics including patient race (white, black, other), and census data were captured from the parent CARES database. These data were merged with census tract data regarding socioeconomic status (SES) of each incident location. The effects of race and SES were analyzed to determine their association with two outcome variables: caller receipt of DA-CPR instructions and subsequent performance of CPR. Multivariate logistic regression analysis was performed. Results: We identified 1,872 cases from 23 dispatch agencies across the state of Michigan, and 61% of calls occurred in a private residence (ORadj: 3.8, 95% CI (2.5–5.8)) or in highest income quartile census tracts [ORadj: 1.65; 95% CI (1.01–2.72)]. Older patient age [ORadj: 0.99; 95% CI (0.98–0.99)] and black race [ORadj: 0.61; 95% CI (0.39–0.98)] were negatively associated with receipt of DA-CPR instructions. Subsequent performance of CPR after DA-CPR instruction was more common in witnessed arrests [OR 2.0, (95% CI 1.3–3.0)] and negatively associated with black race [ORadj: 0.31; 95% CI (0.16–0.58)]. There was no difference by socioeconomic or demographic characteristics. Conclusion: Although this preliminary study is limited by incomplete demographic and dispatch data, we identified racial disparities in provision of DA-CPR instructions and subsequent CPR performance. These findings varied minimally by SES or other demographic characteristics.

46. UTILIZATION OF EMERGENCY MEDICAL RESOURCES AT MASS GATHERING EVENTS AT AN URBAN UNIVERSITY WITH A COLLEGIATE-BASED EMERGENCY MEDICAL SERVICES AGENCY

Emma Ordway, Neil Sarna, Lindsey DeGeorge, Jose Nable, Georgetown University Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Mass gathering events (MGEs) challenge medical directors and emergency medical services (EMS) agencies with providing appropriate and sufficient medical resources. This study aimed to examine EMS resource utilization during MGEs at a medium-sized urban university with a collegiate-based basic life support (BLS) agency, and how such utilization may be associated with specific attributes of these events. Methods: All emergency medical dispatches for the studied on-campus EMS agency during MGEs were included for analysis in this retrospective study, covering MGEs from January 1, 2012 through September 1, 2016. This collegiate-based agency is the sole provider of medical standby details at its university. Environmental factors such as temperature, location (indoors vs outdoor), estimated event size, and event type were analyzed for each MGE based on data from standby duty logs and the National Weather Service. Linear regression, logistic regression and bivariate correlation were used to determine relationships between environmental factors and patients-per-event presentation rates (PPR) to EMS during these events. Results: No calls for service occurred for any events with more than 500 attendees, while at least 1 call for service occurred at 6.1% of events with 500–1000 attendees and at 24.5% of events with over 1000 attendees. No significant differences were found to be significant predictors of PPR, with p-values of 0.72 and 0.65, respectively. However, in the subset of events that attracted more than 1000 people and included outdoor sporting events, the linear regression of PPR and temperature had a Pearson’s Correlation Coefficient of 0.983 and a p-value of 0.017. Outdoor non-sporting events, as compared to indoor non-sporting events, had an increased likelihood of calls for service (OR 4.4, p = 0.005). Conclusions: This study highlights that environmental features such as estimated crowd size, location, event type, and outdoor temperature can possibly be used to predict EMS resource utilization at MGEs. University administrators, event organizers, and EMS agencies can potentially prepare medical plans for such mass gatherings by pre-assessing these event attributes.

47. SIMPLE FEEDBACK FORM IMPROVES QUALITY OF OUT-OF-HOSPITAL CPR

Ben Weston, Jamie Jasti, Melissa Mena, Jackson Unterner, Kelly Tilotton, Ziyin Yan, Mario Colella, Tom Aufderheide, Medical College of Wisconsin Category of Submission: OPERATIONS, QUALITY, SAFETY, SYSTEMS, DISASTER

Background: Despite medical advances and health awareness campaigns, the incidence of prehospital cardiac arrest remains high while survival rates remain low. Excellent prehospital care is tantamount to survival and high quality CPR is a vital contributor to positive outcomes. A quality improvement program was recently implemented to provide simple, goal based feedback to prehospital providers after each cardiac arrest resuscitation. Expanding upon an earlier preliminary study, we aim to assess whether the provision to prehospital providers of a simple CPR feedback form led to improved quality metrics in out of hospital cardiac arrest resuscitations. Methods: This before and after retrospective review evaluated data from a quality improvement program in a midsized urban community with BLS and ALS providers. Two 9-month periods, one before and one after
the implementation of the form were evaluated. Metrics measured included the means and rates of success for compression rate, fraction, and as well as preshock pause time. Results: A total of 439 before encounters and 621 after encounters were evaluated including 21,962 EMS providers. Overall, significant differences were found in the mean compression depth (5.0 cm vs. 5.5 cm; p < 0.001), compression fraction (79.2% vs. 86.4%; p < 0.001), compression rate (109.6 min vs. 114.8/min; p < 0.001) and preshock pause time (18.8 sec vs. 11.8 sec; p < 0.001). Additionally, improvements were noted in goal achievement for compression rate (48.5% vs. 66.3%; p < 0.001), compression fraction (68.1% vs. 91.0%; p < 0.001), and preshock pause time (24.1% vs. 59.5%; p < 0.001). No significant difference was found in goal achievement of compression rate.

Conclusions: We found that the introduction of a simple CPR feedback form to prehospital providers was associated with improvement in prehospital CPR quality.

48. CUMULATIVE SUCCESS OF PREHOSPITAL ADVANCED AIRWAY MANAGEMENT IN A NATIONAL COHORT

Jeffrey Jarvis, Dustin Barton, Henry Wang, Williamson County EMS CATEGORY OF SUBMISSION: MEDICAL

Background: Repeated attempts at Advanced Airway Management (AAM) are associated with increased risk of adverse events. There are few current descriptions of the number of attempts needed for success. We sought to characterize cumulative AAM success rates in a national cohort of Emergency Medical Services (EMS) agencies. Methods: We used 9 years of data from ESO Solutions, a national EMS electronic health record system. We included all encounters with attempted AAM. We examined the number of (1) cardiac arrest intubation (CA-ETI), (2) medical non-intervention (NA-ETI), (3) rapid-sequence intubation (RSI), (4) sedation-assisted ETI (SAI), and (5) some type of supraglottic airway (SGA). Using binomial proportions with exact confidence intervals, we determined the cumulative success rates for each attempt. We also identified a minimum number of attempts for success (FPS) and overall success (OS), and the number of attempts needed to reach OS. Results: A total of 61,793 patients from 552 EMS agencies underwent a attempted AAM. Of these, 38,063 CA-ETI, 19,138 NA-ETI, 7,229 RSI, 3,095 SAI, and 9,993 SGA. The number of AAM attempts per patient varied (median 1, range 1–10). CA-ETI performance was: FPS 71.4% (95% CI: 70.3–72.6%), 4 attempts to reach the OS threshold of 91.7% (91.4–92.1), NA-ETI performance was: FPS 66.3% (95% CI: 65.4–67.2%), 3 attempts to reach the OS threshold of 90.4% (9.8–91.1%), RSI performance was: FPS 75.9% (95% CI: 74.9–76.9%), 5 attempts to reach the OS threshold of 96.3% (95.7–96.9%), SAI performance was: FPS 66.9% (95% CI: 65.2-68.6%), 4 attempts to reach OS threshold of 89.6% (85.6–88.1%). SGA performance was: FPS 88.5% (95% CI: 88.0–89.0%), 5 attempts to reach OS threshold of 93.2% (92.6–93.6%). Conclusions: In this national series, first pass prehospital AAM success rates have improved from prior studies but are still low. Multiple attempts are common. These results may guide protocols limiting AAM attempts.

49. BENCHMARKING EMS COMPASS PERFORMANCE MEASURES USING A LARGE NATIONAL DATASET: PEDIATRIC CARE

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nudell, Williamson County EMS CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY, SYSTEMS, DISASTER

Background: Children make up ~10% of all EMS transports, often require weight-based dosing and are commonly affected by respiratory issues. A subset of the EMS COMPASS performance measures addresses pediatric care, including documentation of weights, vital signs, and respiratory rate. Little is known about the performance on these metrics. We describe the metrics performance on these measures and national series, first pass prehospital AAM success rates, use of ETI, use of SAI, and SGA.

Methods: Using a 6½ year sample of 9.4-1 EMS records, we used the ESO electronic health record (EHR), we calculated compliance rates among transported children and the number of attempts to reach an OS threshold of 86.9% (85.6–88.1%). No benchmark data for these measures have been done on a national scale. We aim to describe these measures using a large national cohort.

Results: We found that the number of AAM attempts per patient varied (median 1, range 1–10). CA-ETI performance was: FPS 71.4% (95% CI: 70.3–72.6%), 4 attempts to reach OS threshold of 91.7% (91.4–92.1), NA-ETI, 7,229 RSI, 3,095 SAI, and 9,993 SGA. The number of AAM attempts per patient varied (median 1, range 1–10). CA-ETI performance was: FPS 71.4% (95% CI: 70.3–72.6%), 4 attempts to reach the OS threshold of 91.7% (91.4–92.1). NA-ETI performance was: FPS 66.3% (95% CI: 65.4–67.2%), 3 attempts to reach the OS threshold of 90.4% (9.8–91.1%). RSI performance was: FPS 75.9% (95% CI: 74.9–76.9%), 5 attempts to reach the OS threshold of 96.3% (95.7–96.9%). SAI performance was: FPS 66.9% (95% CI: 65.2-68.6%), 4 attempts to reach OS threshold of 89.6% (85.6–88.1%). SGA performance was: FPS 88.5% (95% CI: 88.0–89.0%), 5 attempts to reach OS threshold of 93.2% (92.6–93.6%). Conclusions: In this national series, first pass prehospital AAM success rates have improved from prior studies but are still low. Multiple attempts are common. These results may guide protocols limiting AAM attempts.

50. AEDS ON WHEELS: A PILOT PROGRAMME TO EQUIP TAXIS WITH AEDS

Alexander White, Desmond Mao, Vernon Kang, Marcus Ong, Singapore General Hospital CATEGORY OF SUBMISSION: CARDIAC

Background: We aimed to determine the feasibility of utilizing AEDs among taxi drivers to improve bystander CPR and whether implementing an AED in a Uniformed Taxi can increase the bystander CPR rate.

Methods: Using a 1.5 km radius around the taxi’s location, we calculated the number of potential out-of-hospital cardiac arrests that occurred within the 1.5 km radius from the taxi’s location. We then divided that number by the number of AEDs that were available to the taxi drivers. We also calculated the number of AEDs that were available to the taxi drivers per 1,000 taxi drivers to determine the feasibility of providing AEDs to taxi drivers.

Results: A total of 109 surveys were completed (54.5% response rate), and 96 of those programs (88.1%) reported that their residents do receive formal medical command training. A majority of those programs begin medical command training during their residents’ first (42 programs, 43.8%) or second (40 programs, 41.7%) year of residency. Most programs do not have required formal classroom-based training for medical command training (75 programs, 77.3%) or online-based (75 programs, 77.3%) training. EMS physicians are the primary individuals providing training (91 programs, 93.8%). Most programs allow their residents to begin giving medical command in their second year of residency (52 programs, 54.7%). A majority of programs do not have a system in place to track how many medical command calls their residents take (63 programs, 66.3%), nor do they assign dedicated medical command shifts to their residents (85 programs, 89.5%). Most programs allow their residents to issue medical command orders without the presence of an attending physician (62 programs, 65.3%). A majority of programs indicated that their residents are provided feedback on their performance for their command call management (83 programs, 85.6%) and most programs indicated that medical command calls by residents are routinely audited (95 programs, 99.4%).

Conclusions: Most EMS residencies train their residents in providing medical command, yet there is wide variation on what is required. Further research and analysis are required to make recommendations for a more uniform system of resident command training.

51. MEDICAL COMMAND TRAINING FOR EMERGENCY MEDICINE RESIDENTS: AN OVERVIEW OF MEDICAL COMMAND EDUCATION, OVERSIGHT, AND EVALUATION

Abagayle Renko, Nicholas Julius, Chadd Nesbit, Penn State Milton S. Hershey Medical Center CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Training Emergency Medicine (EM) residents provide medical oversight as a requirement for EM residency accreditation through the ACCME; yet, no standard curriculum from which to develop this essential skill exists and literature describing the current state of resident medical command training is limited. We sought to assess the state of medical command training in EM residency programs. Methods: A thirty question survey was created and distributed electronically through email via the Research Electronic Data Capture (REDCap) program. The survey contained questions regarding demographics, general facility and program descriptors, medical command training procedures, personnel providing command, and feedback. Descriptive statistics were collected and analyzed using chi-squared tests for categorical variables. Results: A total of 109 surveys were completed (54.5% response rate), and 96 of those programs (88.1%) reported that their residents do receive formal medical command training. A majority of those programs begin medical command training during their residents’ first (42 programs, 43.8%) or second (40 programs, 41.7%) year of residency. Most programs do not have required formal classroom-based training for medical command training (75 programs, 77.3%) or online-based (75 programs, 77.3%) training. EMS physicians are the primary individuals providing training (91 programs, 93.8%). Most programs allow their residents to begin giving medical command in their second year of residency (52 programs, 54.7%). A majority of programs do not have a system in place to track how many medical command calls their residents take (63 programs, 66.3%), nor do they assign dedicated medical command shifts to their residents (85 programs, 89.5%). Most programs allow their residents to issue medical command orders without the presence of an attending physician (62 programs, 65.3%). A majority of programs indicated that their residents are provided feedback on their performance for their command call management (83 programs, 85.6%) and most programs indicated that medical command calls by residents are routinely audited (95 programs, 99.4%).
Emergently to the Operating Room or Admitted to Intensive Care Units

Joslyn Joseph, Joshua Bucher, David Feldman, Albert Ritter, Frederick Fiesseler, Morristown Medical Center Category of Submission: Operation, Quality, Safety, Systems, Disaster

Background: A two-tiered EMS system has the advantage of incorporating volunteer, public, and private BLS ambulances into the system to decrease response times and spread resources further. An ALS unit who responds to a scene may call for a “triage” or “release” to BLS if no ALS interventions are warranted outside of BLS scope of practice to allow their unit to stay in service. To date, no studies have evaluated the characteristics of high-risk patients “released” to BLS and then taken to the Operating Room (OR) or admitted to the Intensive Care Unit (ICU). In order to make safer triage decisions, we sought to describe this “near-miss” mstrigated population of patients who were ultimately deemed to be critically ill by Emergency Departments and had the potential to decompensate quickly. Methods: Setting: A suburban two-tiered EMS system in which ALS units evaluate approximately 14,000 patients per year. All patients from 2007–2015 “released” to BLS, transported to an Emergency Department, and subsequently admitted to an ICU, Cardiac Catheterization Lab, or Operating Room. Demographics, history of present illness, vital signs, GCS, disposition, final diagnosis, and interventions done prior to EMS arrival and by EMS personnel were extracted via chart review and 95% Confidence Intervals (CI) calculated when appropriate. Results: Of 17,839 patients from 2007–2015 who were evaluated by ALS and triaged to BLS, 372 were mstrigated to BLS. The average age of patients was 66.4 years (CI: 61.0–71.7) and 52% were female. The most common mstrigated final diagnosis category was Neurological, 24% (23.3–24.7), followed by GI/Abdominal Emergencies 15% (14.3–15.7%). Sepsis was mstrigated 10.2% (9.5–10.9) of the time, and 9 patients, 2.4% CI (2.3–2.6) were taken emergently to the Cardiac Catheterization Lab. Conclusions: This is the first step to investigate this phenomenon unique to two-tiered EMS systems. From our study, we can conclude that triage decision is needed to recognize prehospital Neurological and Abdominal/GI Emergencies to avoid near misses in the future. More research is also needed to determine if patient outcomes had poor outcomes as a result of being mstrigated to make triage protocols safer for our patients.

53. ASTounding Rates of Suicidality in EMS Providers: A Hidden Epidemic

Al Lulla, Jotirmoy Das, Ghady Rahhal, Rebecca Dougherty, Bridgette Svanarek, Washington University in St. Louis Category of Submission: Student, Resident, Fellow

Background: EMS providers experience severe work-related stress associated with their risk of suicidality. Past suicidal thoughts and attempts have been established as placing individuals at high risk for future suicidal behavior. We sought to assess the severity of the problem among high-risk patients. Methods: We administered a 19 item questionnaire based on the Secondary Survey of the Responder (score of 0-7, 0 = normal, 7 = severe) to 16 EMS agencies and 1,688 EMS providers. In order to assess for suicidality, the Suicide Behaviors Questionnaire Revised (SBQ-R) was utilized. Dimensions included; duration of ideation, lowest ideation using a Likert scale. 4 dimensions are (1) lifetime suicidal ideation and/or suicide attempt, (2) frequency of suicidal ideation over past 12 months, (3) threat of suicide attempt, and (4) likelihood of future suicidal behavior. In prior studies, a SBQ-R score of 7 or greater has been validated as an effective predictor of suicidal behavior. The SBQ-R score has previously demonstrated ability to identify individuals at risk for suicide with 93% specificity and 95% sensitivity using a cut-off score of 5. This study aimed to determine the relationship between suicidality and gender, age, shift-lengths, hours worked per week, years in EMS, race, practice setting, service type, family history of suicide, and knowing an EMS provider who committed suicide. Results: We received 289 completed surveys analyzed less than 2 weeks after survey distribution. 37% of respondents (95% confidence interval: CI: 25.5–36.1%) of individuals had SBQ-R scores greater than or equal to 7, reflecting suicidality. The strongest predictors of suicidality were family history of depression or suicide [OR = 3.0 (1.8–5.1)], and working in a hospital-based service [OR = 2.0 (1.0–4.0)]. Gender, age, race, practice setting, shift lengths, hours worked per week, years in EMS, and knowing an EMS provider who committed suicide were not found to be statistically significant predictors of suicidality. The strongest predictors of suicidality in the past 12 months were family history of depression or suicide [OR = 3.0 (1.8–5.1)], and working in a hospital-based service [OR = 2.0 (1.0–4.0)]. Gender, age, race, practice setting, shift lengths, hours worked per week, years in EMS, and knowing an EMS provider who committed suicide were not found to be statistically significant predictors of suicidality. Conclusions: High rates of suicidality exist within the EMS community; further, however, future research on risk factors and potential solutions needs to be conducted.

54. Identification of Sepsis in the Prehospital Setting: An Observational Study of Paramedic Sepsis Screening Strategies

Daniel Lane, Ian Blanchard, Gerald Lazarenko, Laurie Morrison, Steve Lin, Hannah Wunsch, Sheldon Cheskes, Refik Saksin, Damon Scales, Institute for Health Policy, Management and Evaluation, University of Toronto Category of Submission: Student, Resident, Fellow

Background: Sepsis is a life-threatening syndrome where earlier recognition and prompt intervention is critical to improving patient outcomes. In modern healthcare systems, paramedics encounter many sepsis patients first, offering an opportunity for earlier detection. The purpose of this observational study was to provide the incidence of paramedic reported suspicion of infection, and to compare the accuracy of published paramedic screening strategies for sepsis within the Prehospital Setting. Methods: A previously published systematic review that identified strategies for paramedic identification of sepsis was updated and used as the source for paramedic screening strategies. A one-year cohort of EMS data linked to in-hospital administrative databases (n = 131,745;9% linkage rate) was used for the cohort of EMS patients. Sepsis was identified by Emergency Department (ED) International Classification of Diseases v.10 Canadian (ICD-10CA) diagnosis codes, and EMS clinical information. The incidence of paramedic documented suspicion of infection in patients diagnosed with sepsis in the ED, and the sensitivity, specificity, positive, and negative likelihood ratios (LR) for each of the screening strategies, using the recommended score threshold as originally published where applicable are reported. Results: Paramedics documented suspicion of infection in 350 of 2,715 [13%(95% Confid ence Interval) 2–14%] sepsis patients. Twelve paramedic screening strategies were identified in the literature. The PRESS, HEWS (score of > 2), and Robson scores had the highest sensitivities [0.980 (0.98–0.99), 0.876 (0.86–0.88), 0.746 (0.73–0.76)] and lowest negative LR [0.080 (0.04–0.08), 0.274 (0.24–0.30), and 0.390 (0.37–0.42), respectively] for ruling out sepsis. The PSP score (high risk) and Sepsis Alert strategies had high specificity [0.980 (0.98–0.98) and 0.990 (0.99–1.0)], and positive LR [19.7 (17–22) and 13.6 (11.6–16.0)] for ruling in suspicion of sepsis. However, the sensitivity was lower for both screening strategies [0.250 (0.21–0.29) and 0.076 (0.06–0.08)]. Comparing the qSOFA score recommended in the Sepsis-3 definition to the previously recommended SIRS score, qSOFA was better for ruling out severe sepsis [positive LR 9.1 (8.5–9.7) vs. 2.7 (2.6–2.8), while SIRS was better for ruling out sepsis [negative LR 0.67 (0.65–0.70) vs. 0.74 (0.72–0.75)]. Conclusions: Paramedics had low rates of documented suspicion of infection in sepsis patients. Paramedic screening strategies may help to identify sepsis, but the choice of strategy will depend on whether the goal is to correctly rule out versus rule in these diagnoses.

55. Preliminary Impact of Adding Follow-Up Home Visits On Call Volumes Generated by EMS “Super-Users” Enrolled in a New Mobile Integrated Health Protocol

Roger Stone, Jamie Baltrotsky, Alan Butsch, Anayel Robinson, Barry Reid, Montgomery County MD Fire Rescue Services Category of Submission: Operations, Quality, Safety, Systems, Disaster

Background: Rising EMS call volumes tax EMS resources in many jurisdictions. A significant contributor to volumes included 9–1–1 callers, some of whom may return home from limited resources. After a new partnership in 2015 between EMS and our County’s HHS agency helped facilitate services for 9–1–1 “super-users”, our previous study found a preliminary association with reduced call volumes. Our agency has now partnered with hospitals to provide more timely care for 9–1–1 callers, some of whom may return home from limited resources. After a new partnership in 2015 between EMS and our County’s HHS agency helped facilitate services for 9–1–1 “super-users”, our previous study found a preliminary association with reduced call volumes. Methods: After our EMS-HHS partnership identified 9–1–1 super-users, we recruited a voluntary sample of HHS “super-users” for our Mobile Integrated Health (MIH) program. We retrospectively measured using CAD and EMS records cumulative call volumes for the group of new enrollees, 90, 60 and 30 days before and after the MIH program started. Results: A cohort of Patients (N = 10) was enrolled in the MIH protocol and scheduled for home visits beginning March 1, 2017. Cumulatively, those patients generated 63, 53, and 30 calls during the periods 90, 60, and 30 days, respectively, prior to the home visits. Thereafter, those calls decreased to 7, 8, and 17 calls for the periods of 30, 60, and 90 days, respectively, after visits began. The change yields 9–1–1 call reductions of 77%, 85%, and 71% during the post intervention three months. Conclusions: We believe the benefits in our large system benefit from a coordinated program of EMS partnerships with public health agencies and hospitals. A new partnership with Hospital Outreach and the initiation of follow-up home visits had preliminary impact on call volumes generated by the enrollees over a 30–90 day period. More studies are needed to prospectively prove valuable to public health, and best practices of these programs, and which interventions during home visits make the most difference.

56. Multi-Disciplinary Community Health Care Interventions Reduce EMS Utilization by Elders

Joseph Petrosino, Jeffrey Boyd, Joanne McGovern, James Dziura, Gina Stover,
A retrospective analysis was performed on all OHCA TOR patients in a large, urban EMS system between January 2013 and December 2016. The off-line and on-line medical control (CPSS) data were reviewed to identify all patients for whom the Provider Impression was “Cardiac Arrest.” The records were individually examined to determine the EtCO2 readings and whether these patients received NaHCO3. Results: A total of 182 OHCA cases were selected which had a documented EtCO2, with 93 receiving NaHCO3 and 89 not receiving NaHCO3. The results were analyzed using a Welch’s t-test. A significant difference was found in EtCO2 readings between the two groups, with a mean EtCO2 of 26 mmHg in the NaHCO3 group and a mean of 19.7 mmHg in the non-NaHCO3 group, with a p-value of 0.026. A subgroup analysis showed that when comparing the 50 highest EtCO2 readings, the significance was even greater, with a mean of 39.9 mmHg in the NaHCO3 group and 27.7 mmHg in the non-NaHCO3 group, with a p-value of 0.0018. When the EtCO2 readings were below 20 mmHg, there was no significant difference. Conclusions: There are no widely accepted guidelines for the technique of TOR in OHCA patients. The value of employing EtCO2 readings in the TOR is unclear. This study indicates that administering NaHCO3 during OHCA will significantly elevate the EtCO2, and NaHCO3 administration complicates the utility of ET in OHCA. The value of employing EtCO2 in the non-NaHCO3 group. Further study of the use of EtCO2 in TOR decisions is necessary.

58. Feasibility of Recording Out-of-Hospital Cardiac Arrest Treatment Via Use of a Mobile Smartphone Application

Samuel Sondheim, Joseph Devlin, William Seward IV, Aaron Bernard, Richard Feinn, David Cone; Department of Emergency Medicine, MD School of Medicine, Quinnipiac University

Background: Given the demanding nature of out-of-hospital cardiac arrest (OHCA) resuscitations, recordings of the times of interventions in EMS patient care reports (PCRs) are often inaccurate. The American Heart Association developed Full Code Pro (FCP), a smartphone application designed to assist providers in recording interventions performed. Through OHCA simulations, this study assessed the group size necessary to use the FCP recording functions accurately and safely without compromising care. Program evaluation was based on participant feedback surveys, data accuracy, delays between recording and performing interventions, and delays in care attributed to using the application, stratified by group size. Methods: Simulations of a standard OHCA scenario using the Gau- mard Trainer 2000 were done with iPhone 5 pre-loaded with FCP version 3.4 were run with group sizes of 2–6 participants, with group sizes determined by participant availability. Participants included Connecticut certified paramedics and paramedic students who had completed the respective coursework. A seven-item feedback survey using a Likert scale established participant feedback on the application. Videos of the simulations were analyzed to assess for delays. One-way ANOVA with trend analysis was used to test if outcomes differed by group size and if differences tended in one direction with increasing group size. Results: There were 37 simulations including 142 participants. The feedback survey questions showed a Cronbach’s alpha of 0.91 signifying high reliability, and trend was clear supporting greater satisfaction with FCP as group size increases (p < 0.001). Similarly, increasing group size displayed linear trends with greater numbers of interventions recorded (p = 0.009) and fewer missed and false readings (p = 0.002). Delays revealed significant linear trends (p = 0.018) for delays in recording (< 0.001 for delays in care), as increasing group size corresponded with lesser delays. Greater improvement was noted to be between groups of 5 and 6 participants. Conclusions: Simulations using FCP demonstrated increased provider comfort, increased recording accuracy, and decreased delays as the group size increased. While the application may improve recordings for PCRs and future research, the data suggest a sufficient number of providers (≥3) should be present to achieve reliable data without compromising patient care.
Background: Paroxysmal supraventricular tachycardia (PSVT) is a common group of arrhythmias that Advanced Care Paramedics (ACPs) can often manage with vagal maneuvers, adenosine, and/or cardioversion, provided that they correctly identify the rhythm. The purpose of this study was to determine the accuracy of ACP identification of PSVT.

Methods: Following ethics approval, all calls with patients ≥18 years with a 12-lead ECG available, were reviewed by ACPs within a region of western Ontario between July 2015 and December 2015 and had a documented heart rate >150 bpm, were included. Paramedic call reports were retrospectively reviewed for study data, including documentation of ACP identified PSVT. The reference standard was consensus between a fellow and prehospital physician who adjudicated each ECG for the presence of PSVT in a blinded, independent fashion. In the event of a disagreement, a third, blinded prehospital physician was used for resolution. Of the 442 patients included, 197 (45%) were male and the median age [Interquartile range(IQR)] was 70.0 years (58.0–82.6). ACPs identified 74 (16.6%) patients as having PSVT, while 60.8% had a history of previous arrhythmia, compared to 31.9% of patients with no ACP identified PSVT (p = 0.026). They were also significantly younger [median(IQR) 65.0 (47.0–75.0)] compared to those without ACP identified PSVT [median(IQR) = 72.0 (61.0–85.0)] (P < 0.0001). Sensitivity of ACP identified PSVT was 33.3% (95%CI: 23.7–43.5) and specificity was 90.6% (95%CI: 87.3–93.3%). The positive predictive value (PV) of ACP identified PSVT was 52.0% (95%CI: 39.8–65.5%), the negative PV was 99.7% (95%CI: 98.1–99.9%), the positive likelihood ratio (LR) was 10.4 and the negative LR was 0.03. Moderate inter-rater agreement was seen between initial ECG interpretations (κappa = 0.42, 95%CI: 0.30–0.54) by the fellow and prehospital physician, while agreement was higher (good) between the two prehospital physicians [κappa = 0.70, 95%CI: 0.48–0.92].

Conclusions: These results indicate that ACPs are adept at identifying PSVT, but are prone to false negative, particularly good sensitivity and specificity seen in this investigation, future studies should investigate ACP recognition of specific rare arrhythmias (antidromic accelerated atrioventricular flutter) that may require different management including avoidance of adenosine.

61. POLICE DEPARTMENT TACTICAL MEDICINE (TACMED) Program Impact on Trauma Patient Mortality: Review of a Large Urban EMS and TACMED System

Elliot Ross, David Wampler, Avery Kester, Xandria Gutierrez, Crystal Perez, Lauren Reeves, Alejandro Mora, Joseph Maddry, Craig Manifold, San Antonio Uniformed Services Health Education Consortium Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Tactical Emergency Medical Services (TEMS) is a growing subspecialty of prehospital care. TEMS providers are ideally suited to provide care at the point of injury in areas traditional EMS cannot enter. A minimal amount is currently known regarding the clinical impact of these programs. This study examines patient outcomes of those treated by a Police based TEMS system vs. traditional EMS.

Methods: Study inclusion criteria consisted of trauma patients where police were dispatched and EMS was staged and were then transferred to a Level I trauma hospital. All patients that died at the scene or enroute were excluded. The computer automated dispatch (CAD) system was used to identify all cases from 2011–2015. The TEMS vs. control group meeting, inclusion criteria were extracted. Demographics, injury description, prehospital index (PHI) scores, disposition, and interventions were collected. Hospital disposition and outcome data were linked using the regional trauma registry. Using gender, injury type/age, and PHI a case-match controlled comparison between EMS and TEMS records (n = 21) was conducted. Chi-square (or Fisher’s Exact) test for categorical and t-test (or Wilcoxon) for continuous variables.

Results: Of the 122,707 call reports examined, 2,243 met inclusion criteria. Seventy TEMS records and 140 EMS case matched controls were included. Majority were male (90%) civilians (99%) with a median age of 31. Sixty percent of patients were injured secondary to a shooting, 30% stabbing, and 10% assault. Moderate to severe bleeding was encountered in 75% of patients, and 46% sustained major trauma (PHI ≥ 4). TEMS providers had a shorter response time compared to EMS providers; 6 vs. 13 minutes, p < 0.0001. Cohorts had similar PHI scores and intervention performance rates. PHI ≥ 23 was the intervention CACR and hospital resource utilization were comparable. Both had similar number of ventilator, ICU, and hospital days. There was no difference in mortality rates between the two groups. Seven TEMS providers offered shorter response times and performed medical interventions at similar rates to traditional EMS. Although no differences in patients treated were noted, all patients who died prior to hospital arrival were excluded. Future studies are needed to determine how response time impacts the rate of preventable death.

62. Optimizing Deployment of Mechanical CPR Does Not Improve OHCA Outcomes When Compared with Manual CPR

Brandon Oyler, Louis Gonzales, Jeff Hayes, Mark Escott, Joel Cabanas, Paul Hinchey, Lawrence Brown, Dell Medical School at the University of Texas Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Deploying mechanical CPR in out-of-hospital cardiac arrest (OHCA) is logistically challenging. Inefficient deployment might explain reports of increased complications and outcomes associated with mechanical CPR. We hypothesized that in an EMS system with optimized deployment, sustained manual CPR to hospital discharge will not differ for OHCA patients managed with and without mechanical CPR.

Methods: In 2015, we initiated a quality improvement process to choreograph and optimize deployment of mechanical CPR. All primary first response agency (attending ≥25% of OHCA cases) field personnel attended in-person training and practical exercises emphasizing high quality traditional CPR, timely defibrillation, airway management / ventilatory support and first-round medication administration before initiating mechanical CPR. We then analyzed all adult, non-traumatic OHCA attended by the first response agency during 2016. During the study period, mechanical CPR devices were deployed on some—but not all—first response units; use of mechanical CPR was based primarily on availability and/or whether patients achieved ROSC after initial resuscitation attempts. We then performed propensity score matching to select cases with and without mechanical CPR that had similar patient demographics and arrest characteristics.

Conclusions: The results of this study demonstrate women are more likely to have delayed STEMI care than men. Methods: This is a retrospective cohort study of 9-1-1 patients who were transported by a single large urban EMS system with optimized deployment, mechanical CPR was associated with decreased ROSC and survival to discharge. 63. Gender Disparities in the Prehospital Setting among Known ST-Strain Elevation Myocardial Infarction Patients

Krystal Bacia, Stephen Sanko, Mark Eckstein, University of Southern California-Los Angeles, California And Los Angeles County And Los Angeles Fire Department Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Identification of a 5T elevation myocardial infarction (STEMI) in the prehospital setting has been shown to decrease door-to-balloon time and mortality. Up to 20% of STEMI patients do not present with typical symptoms and gender disparities exist in the prehospital setting in the assessment of patients ultimately found to have ACS. Our hypothesis is women are more likely to have delayed STEMI care than men.

Methods: This is a retrospective analysis of 9-1-1 call data from a large urban EMS system with optimized deployment, mechanical CPR was associated with decreased ROSC and survival to discharge. 64. Statewide Retrospective Analysis on the Characteristics of EMS Refusals of Care

Novneet Sahu, Patrick Matthews, Ross Megargel, Rutgers University-New Jersey
Background: Improving EMS systems of care requires a better understanding of out-of-hospital refusals of care. There is a paucity of data on EMS refusals of care. Studies over the past three decades have shown widely varying results on the characteristics, demographics, and rates of EMS refusals of care. The purpose of this study is to analyze, at the state level, the characteristics, demographics, and rates of EMS refusals of care to provide a platform for identifying targets to help improve EMS systems of care. Methods: Delaware statewide EMS data for all refusals and transports were queried for the calendar year of 2016. Age, gender, dispatch reason, time of year, and location were aggregated and retrospectively analyzed through descriptive statistics and multi-variate logistic regression. Results: Of the 155,303 EMS incidents, 12,744 (7.9%) resulted in refusals of care. Patients 65 years and older had a smaller percentage of refusals than adults 18–64 years old and children <18 years old (6.4% vs. 8.8% vs. 11.3%). Male patients had a greater refusal rate than women (8.3% vs. 7.3%, p < 0.001). Diabetes-related problems (36.2%) and motor vehicle accidents (28.5%) resulted in the highest refusal rates (p < 0.001). The highest percentage of overall refusals occurred during mid-summer (8.8%, p < 0.001). Locations of care which include places of recreation and bodies of water had the highest refusal rates (45.6% vs. p < 0.001). Conclusions: In this population, geriatric patients had lower refusal proportions; whereas, prior studies suggested that geriatric patients are greater than other age groups. The greater refusal rate among men is consistent with previous literature. Prior studies have shown the highest rates of refusals for motor vehicle incident and other transfers, however, diabetes-related problems comprised the highest percentage of refusals in this population. Mid-summer time of year and places of recreation also comprised high percentages of refusals and further investigation is necessary to identify root causes of these patterns.

65. Feasibility of Point-of-Care Ultrasound (POCUS) in Out-of-Hospital Cardiac Arrest (OHCA) by Novice Ultrasonographers

James Fitzgibbon, Emily Lovallo, Marek Radomski, Jeremiah Escaeda, Christian Martin-Gill, Department of Emergency Medicine, University of Pittsburgh School of Medicine Category of Submission: Cardiac Ultrasound Category of Submission: Out-of-Hospital Cardiac Arrest (OHCA) by Novice Ultrasonographers

Background: Point-of-care ultrasound (POCUS) may be a useful tool to predict survival and guide interventions in out-of-hospital cardiac arrest (OHCA), yet a paucity of data exists on its prehospital use by users with limited ultrasound experience. We aimed to determine the feasibility of using POCUS during OHCA by resident and fellow physicians staffing a 24/7 prehospital response vehicle and identify barriers to adoption. Methods: We deployed a portable ultrasound device (Vivz, by Sonosite) for use by prehospital physicians for OHCA in an urban EMS system. All physicians received POCUS education as part of graduate training, and were provided an instructional video on use of the Vivz device. POCUS use was limited to identifying cardiac motion during CPR, wall motion, and T-wave morphology. Exposure to resuscitation, and the results could be used to guide management at the physicians’ discretion. Data were recorded prospectively by saving video and still images on the device and through a custom electronic form within the patient care report (emsCharts). The primary measure was the frequency of use of POCUS during OHCA. Secondary, we characterized image quality and fellowship trained faculty review (using kappa statistic for agreement), and identified barriers to the use of prehospital POCUS. Results: From November 1, 2016 through March 31, 2018, 248 physician and expert field responses were reviewed, including 127 cases of OHCA, and 56 (44%) cases with POCUS performed. Still or video images were recorded in 48 (86%) cases and video in 34 (61%) cases. From video images, agreement in identifying cardiac motion between prehospital physician and expert reviewer occurred in 91% of cases (κ = 0.83). 29% of respondents for not using POCUS included return of circulation soon or before arrival, prioritizing interventions, provider preference, not having the ultrasound device, mechanical failure, and cessation of resuscitation per advanced directives. Conclusions: Use of POCUS by novice prehospital physician ultrasonographers to detect wall motion in OHCA is feasible and correlates with expert interpretation. Several avoidable barriers to the use of prehospital POCUS may be addressed through additional educational interventions and increased familiarity with the device.

66. Air Versus Ground Transfer to Comprehensive Stroke Center in Patients with Large Vessel Occlusion Stroke

Ali Shams, Chris Kanaan, Rebbeca Grysziewicz, Chris Kazmierczak, Laura Steucher, Robert Swor, Beaumont Health Category of Submission: Cardiac Category of Submission: Out-of-Hospital Cardiac Arrest (OHCA) by Novice Ultrasonographers

Background: Optimal treatment ischemic stroke caused by a large vessel occlusion (LVO) involves timely transfer from a primary stroke center to a comprehensive stroke center (CSC) that can offer mechanical endovascular therapy. Transfers are either done via air or ground, however data have not shown a clear benefit of one method of transfer over the other. The objective of this study was to compare air vs. ground transfer times from decision to transfer to definitive care in patients with LVO strokes transferred to a single CSC. Methods: This is a cohort study. The cohort included LVO single suburban CSC (January 2015–December 2016) from seven primary stroke centers within single suburban CSC (January 2015–December 2016) from seven primary stroke centers within. Results: Of 165 surveys completed, 87.5% of responders rated EMS air transport as important. No differences in responses were found related to patient age, gender or ethnicity. Analysis of the Likert data, showed no significant differences with respect to perceived provider trust, trust, likability or confidence. However, participants answered significantly lower on the Likert scale for willingness to discuss confidential information with the providers in the transfer decision. Conclusions: Based on the results, it is uncertain whether air or ground transport has any impact patient perceived quality of care. Lower responses were found for ground transport, possibly from a lack of association of EMS providers with the air. Future studies with larger sample and those that analyze more outfits or aspects of provider appearance would lend support to this conclusion. Our study was small, limited by length of the videos, and number of outfits tested but our results conclude air as a minor factor in EMS responses.

68. Multivariable Analysis of Factors Associated with EMS Non-transports

Rickuel Tripp, Jonathan Elmer, Francis Guyette, Christian Martin-Gill, Department of Emergency Medicine, University of Pittsburgh School of Medicine Category of Submission: Operations, Quality, Safety, Systems, Disasters

Background: Emergency response without transport confers a risk of negative patient outcomes, increased liability, and non-payment. Yet, little rigorous research has been done to identify risk factors for non-transports. We aimed to identify demographic and clinical characteristics predictive of non-transports using a large database of out-of-hospital EMS responses. Methods: We retrospectively reviewed consecutive post-resident patient care records from 21 urban, suburban, and rural EMS agencies in Western Pennsylvania from April 2013 to December 2014. Demographics, age, gender, race, ethnicity, level of transport, distance to hospital, and transport time were recorded. Regression analysis and logistic regression were performed on the resulting 2,825 non-transport records to identify factors contributing to non-transport. Results: Eleven factors were predictive of non-transport: age ≥ 65 years; race (non-white vs. white); gender (male vs. female); distance ≥ 15 miles; pain; heart rate ≥ 120; pain ≥ 6; diastolic BP < 40; systolic BP ≥ 200; no pulse; and, discharge destination (an ED vs. home). The analysis was repeated in the 20% of records randomly selected to validate the results. Conclusions: The results of this study may guide EMS personnel in the decision to transport patients to the hospital. Our study reflects the challenges of transporting patients to hospital, and may provide valuable insight into non-transport decisions.
last vital signs (BP, RR, HR, SPO2, and GCS), loss of consciousness (LOC), abnormal mental status (AIS), and time of day. We excluded cases of cardiac arrest, interfacility/scheduled transports, EMS assist, no patient encountered, and patients aged <18 years or unknown age. For non-transports, we described the incidence of protocol-defined abnormal vital signs (HR < 50, >100; SBP < 100, >200; DBP = 50, >100; RR < 12, >24; SpO2 < 95%) and LOC, and AMS. We used unadjusted and adjusted logistic regression to identify independent predictors of non-transport. Results: We identified 385,908 cases meeting study criteria, with 35,266 (9.1%) non-transports. Patient characteristics were: median age 59 years (IQR 41–77), 55.6% female, 16.8% black, 0.7% Hispanic, and 96.3% advanced life support (ALS). Incidence of abnormal vital signs were: HR = 4435, 12.6%; SBP = 539, 1.5%; DBP = 1324, 3.8%; RR = 159, 0.3%; SpO2 = 1543, 4.4%; and GCS = 834, 2.4%. There were 785 (2.2%) with LOC and 2031 (5.8%) with AMS. In adjusted multivariable analysis, we identified associations (OR, 95% CI) with non-transports and in multiple logistic regression: (1.0, 1.04, 1.07), and morning [6:00–11:59] hours (0.79, 0.70–0.88) and evening [18:00–23:59] hours (1.07, 1.03–1.11), compared to overnight [00:00–5:59] hours. Most associated with non-transports were trauma (2.37, 1.79–3.14), dizziness/syncope (1.50, CI 1.47–2.20), and allergic reaction (OR 1.54, CI 1.33–1.79). Race, ethnicity, LOC, and AMS were not associated with the incidence of non-transports. Conclusions: Patients not transported by EMS often have abnormal heart rate and are associated with complaints of trauma, dizziness/syncope, or allergic reaction. This information can guide patient refusal protocols and future research on outcomes of these at-risk patients.

69. Among STEMI Patients, Is Inferior ST Elevation Associated with a Higher Frequency of Hypotension after Field Nitroglycerin? Nichole Bosson, Jayson Morgan, Benjamin Isakson, Amy Kaji, Atilla Uner, Katherine Hurley, Timothy Henry, Marianne Gausche-Hill, James Niemann, LA County EMS Agency CATEGORY of SUBMISSION: CARDIAC Background: Patients with inferior STEMI involve the right ventricle are believed to be at higher risk for hypotension after nitroglycerin (NTG). The objective of this study was to determine if inferior STEMI is associated with increased risk of hypotension upon ED arrival in patients treated with NTG by EMS. Methods: Consecutive adult patients with suspected STEMI transported by EMS to one of three participating PCI-capable hospitals were prospectively identified and maintained in a log during an 18-month period. Investigators reviewed records for initial field and ED vital signs, field NTG treatment, and hospital outcomes. Inter-rater reliability was assessed on a random 10% sample of records using the kappa statistic. Patients with hospital diagnosis of STEMI treated with NTG were included. Patients with hypotension on EMS arrival were excluded. Inferior STEMI was defined as ST-elevations in the inferior leads on the prehos- pital ECG, and hypotension was defined as a triage SBP less than 100 mmHg, patients with inferior STEMI was compared to patients with non-inferior STEMI. Patients used stratified by lesion location. The frequency of hypotension was compared with Fisher’s exact test and change in SBP with Hodges-Lehmann Median test. Results: 118 patients with STEMI, 46 were excluded for ini- tial hypotension and 38 did not receive NTG; thus, 155 comprised the study cohort. Median age was 61 years; 71% male. Hypotension occurred in 10 (14%) with inferior STEMI and 3 (4%) with other STEMI. RR 1.13 (95%CI 1.00, 1.23) p = 0.04. Hypotension was mild; one patient with inferior STEMI arrived with SBP <90 mmHg. Inter-rater reliability was excellent, kappa 0.93 (95% CI 0.80, 1.0). Mean decrease in SBP was −15 ± 23 mmHg and −10 ± 22 mmHg in inferior and other STEMI, respectively. The mean difference in the decrease in SBP = −4.5 mmHg (95% CI −12.0, 3.0). Compared to patients treated with PCI in any other location, hypotension after NTG among inferior STEMI patients was more common. RCTA lesions was similar, RR 1.0 (95%CI 0.9, 1.1) p = 0.6. Conclusions: When compared with other STEMI patients, those with inferior STEMI had a slightly higher risk of mild hypotension after field NTG; RCA lesion location was not associated with an increased risk.

70. Characteristics of EMERGENCY MEDICAL TECHNICIAN GRADUATES UNSUCCESSFUL ON THE NATIONAL CERTIFICATION COGNITIVE EXAMINATION Rebecca Cash, Remle Crowe, Madison Rivard, Ashley Iskren Krebs, Jeremy Miller, Ashish Panchal, National Registry of Emergency Medical Technicians CATEGORY of SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS, DISASTER, DISASTER Background: Research on EMT student performance has focused on pass rates and characteristics related to success. Conversely, a minimal amount is known regarding EMT graduates who were unsuccessful at passing the examination. The objective of this study was to describe demographics and test-related performance of graduates unsuccessful on the computer adaptive National EMT Certification examination. Methods: National EMT Certification cognitive examination results for graduates of non-military EMT education programs from the class of 2013 were analyzed as a cross-sectional evaluation. The computer adaptive test terminates when the 95% confidence interval surrounding the estimate of the candidate’s ability is entirely above or below the passing standard. Test length is dictated by these questions. Unsuccessful testers were defined as candidates who had a grade of fail or incomplete (did not finish the examination) on their first examination attempt. Chi-square tests were used to compare demographics of candidates and to assess for differences in retesting between minimum and maximum length testers. Results: A total of 59,560 EMT graduates from the class of 2013 attempted the National EMT Certification cognitive examination and 33% (n = 19,899) were unsuccessful the first attempt. The proportion of males and females who were unsuccessful did not differ (males: 34%, n = 12,642; females: 33%, n = 6,187, p = 0.05). More than one-third of unsuccessful candidates received the maximum number of questions (56%, n = 7,128) while 40% (n = 7,985) received the minimum number of questions. Of those unsuccessful on the first attempt, 66% (n = 13,111) attempted retesting. More maximum length testers attempted a second examination compared to minimum length testers (72%, n = 5,156 vs. 60%, n < 0.001). Conclusions: Two-thirds of first-time candidates unsuccessful on the National EMT Certification cognitive examination attempted a second examination. Approximately one third of those close to the passing standard (maximum length testers) retested. Future work is needed to bet- ter understand the reasons behind candidate retaking including personal and educational experiences.

71. INTERFACILITY TRANSPORT OF THE PREGNANT PATIENT: A 5-YEAR RETROSPECTIVE REVIEW OF A SINGLE ACADEMIC CENTER BASED CRITICAL CARE TRANSPORT PROGRAM Philip Nawrocki, Assa Margalit, Shawn Braat, Matt Levy, Johns Hopkins Lifetime CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW Background: Interfacility transport of pregnant patients involves unique challenges and considerations. Data from the National Emergency Medical Services Information System (NEMSIS) database indicate that 0.6% of all EMS transports and 0.6% of interfacility transports involve pregnant patients. Limited information exists surrounding the safety and adverse events of this patient population in the out-of-hospital setting. This study aimed to examine clinically significant adverse events that occur during the interfacility transport of pregnant patients. Methods: A retrospective review of quality assurance data was performed. The study population consisted of pregnant patients transported to the labor and delivery units of two hospitals within a single tertiary obstetrical-care hospital system between January 2012 and December 2016. Primary outcomes (adverse events) were defined as: hypotension, respira- tory distress, exacerbation of hypotension due to disease of pregnancy (preeclampsia, eclampsia), need for vasoactive medications, dysrhythmia, intubation or unintended extubation, change in mental status, need for restraints, cardiac arrest or death, and delivery during transport. Use of online medical direction and reason for consultation were secondary outcomes of interest. Results: Our critical care transport system performed 30,181 total interfacility transports within the five year study period. 709 patients (2.4%) met inclusion criteria. Clinically signifi- cant adverse events occurred during 32/709 patient transports (4.5%). The most frequent events were: exacerbation of hypertensive dis- ease requiring intervention (25), hypotension (4), and altered mental status (2). There were zero instances of cardiac arrest, death, or deliv- ery. Conclusions: Interfacility transport of preg- nant patients is a common occurrence that involves unique challenges and risks. Within the experience of this critical care transport program, significant adverse events were identi- fied in 4.5% of transports over a 5-year period. This data will help guide the training of prehospital providers and the formation of protocols to mitigate and respond to these events. Notable limitations include the use of data from a single system, absence of some transports, and use of paramedic/nurse crew configuration.

72. ADVANCED PROVIDER RESPONSE UNIT (APRU), AN ANSWER TO LOW-ACTIVITY 9-1-1 CALLS? Saman Kashani, Stephen Sanko, Marc Eckstein, USC Keck School of Medicine, Dept of Emergency Medicine, Los Angeles Fire Department CATEGORY of SUBMISSION: STUDENT, RESIDENT, FELLOW Background: The Los Angeles Fire Department (LAFD) has experienced an unsustainable increase in 9-1-1 calls. Over the past 2 years, call volume rose by 14%; vastly higher than the historical rate of increase of 1–2%. To address the increasing call volume, while still providing care for the citizens of Los Angeles, the LAFD launched the Advanced Provider Response Unit (APRU). The APRU is a multidisciplinary, concierge-styled service staffed by a licensed advanced practice
provider (APP) and a firefighter/paramedic with the mission of treating and releasing patients, providing linkage to further care. This is a description of the first 19 months of service. Methods: This was a retrospective review of LAFD electronic health records referred to from August 2017 to April 2018 in the Los Angeles area. The APRU was active 4 days a week for approximately 82 weeks. Enrolled patients were either low-acuity 9-1-1 callers, identified through monitoring 9-1-1 radio traffic or housed (i.e., non-homeless) 9-1-1 frequent users identified from prior LAFD health records. Summary descriptive statistics were collected. Results: The APRU was linked to 1,079 incidents over approximately 328 days of service (mean 3.3 incidents/day). Of these incidents, there were 127 cancellations, 58 found no patient, 13 refused care, and another 12 were ineligible for APRU care. The remaining 839 were treated (77.8%). Of those treated, 359 (45.2%) were treated and care was transferred to another transporting unit, 360 (42.9%) were treated and released on scene, and 100 (11.9%) were treated and transported. Of the 100 transported by the APRU, 58 were transported to a hospital but had no contact with 53 transported directly to mental health clinics and 3 to a sobering center. Of the 360 and treated released on scene, the APRU spent an average of 23 minutes on scene (minimum 1 minute, maximum 1 hour 15 minutes, median 20 minutes).

Conclusions: The LAFD APRU has shown promise in decreasing costly EMS transports and care, by leveraging the diagnostics skills of the APP, patients can be treated and released on scene or medically cleared for alternate destinations. Further research is needed to study this novel type of EMS care.

73. Predictive Value of Each Component Field Triage Guidelines on Hospital Outcome in EMS-Treated TBI

Sola Kim, Sang Do Shin, Kyoung Jun Song, Young Sun Ro, Jeong Ho Park, Seoul National University Hospital CATEGORY OF SUBMISSION: Student, Resident, Fellow

Background: Unbiased estimates for field triage guideline performance are important in understanding systems and improving outcomes among seriously injured patients. The accuracy of each triage component has not been evaluated in traumatic brain injury (TBI) patients. Herein, we evaluated a triage algorithm as a diagnostic test, we considered the standard to be mortality and disability, which is the final hospital outcome. The aim of this study is to predict the performance of each component of field triage guidelines on hospital outcomes in TBI patients.

Methods: This was a cross-sectional observational study using a nationwide, prospective registry of severe trauma patients treated by emergency medical services (EMS) providers in 10 provinces in Korea. The study population was adult_TBI patients between January 2013 and December 2015. The main exposure was each component of field triage set by the American College of Surgeons Committee on Trauma and Centers for Disease Control and Prevention as determined by EMS provider. The primary outcome was hospital mortality and secondary outcome was disability at discharge. Disability is defined as new or worsened Glasgow Outcome Scale (GOS). Sensitivity, specificity and area under the curve (AUC) were calculated. Results: Total 5,133 patients met the field triage guidelines. 21.5% died and 51.4% of patients had disability. The sensitivity and specificity for mortality of the physiologic, anatomic and mechanical criteria were 91.4% and 47.9%, 20.0% and 93.15%, 57.9% and 89.3%, respectively. Among each component of criteria, altered mentality showed highest sensitivity (98.2% CI 97.4% to 99.0%) and specificity (99.6% CI 99.6% to 99.9%). Altered mentality showed highest sensitivity and AUC for disability, which was 75.9% (95% CI 71.4% to 77.3%) and 0.675 (95% CI 0.658 to 0.684), respectively. Conclusions: The physiologic criteria of field triage guidelines showed high sensitivity for mortality. Anatomic and mechanical criteria showed low sensitivity and high specificity. The trend was similar for disability. Altered mentality of physiologic criteria showed highest sensitivity and AUC among each component of field triage scheme.

74. Effect of Chest Compression Parameter Variation on Waveform Characteristics of the Ventricular Fibrillation Electrocardiogram

David Salcido, Matthew Sundermann, Allisson Koller, Rena Sufrin, John Kucewicz, Pierre Mourad, Graham Nichol, James Menegazzi, Adeyinka Adedipe, Department of Emergency Medicine, University of Pittsburgh School of Medicine CATEGORY OF SUBMISSION: Cardiac

Background: The ventricular fibrillation (VF) electrocardiogram (ECG) waveform is known to deteriorate over time if untreated, recover with CPR, and to predict defibrillation success. VF ECG measures could inform CPR quality feedback algorithms based on patient physiologic response. Objectives: Investigate the effects of chest compression rate, depth and duty cycle (DC) on VF ECG waveform characteristics in a swine cardiac arrest model.

Methods: Twelve mixed-breed domestic swine were sedated (ketamine & xylazine), anesthetized (fentanyl) and paralyzed (vecuronium), followed by endotracheal intubation and mechanical ventilation. Animals were instrumented with a battery of physiological sensors, including multi-lead ECG (BioAmp, ADInstruments, Inc), recorded continuously with a high-fidelity data acquisition unit (Pow-eLab, ADInstruments, Inc). Ventricular fibrillation was induced with a 3-second 100 mA transhoracic shock. After 7 minutes, animals were randomized to receive continuous CPR with a custom robotic device using 1 of 6 pre-programmed, 2-phase CPR schemes that varied 1 parameter in 5 x 1-minute intervals per phase while holding the other 2 parameters fixed. Frequency (AMSa) and slope-based (MS) quantitative ECG characteristics of artifact-filtered ECG were calculated from 3-second segments at the end of each 1-minute interval and compared between rate, depth and DC schemes, as well as experimental phases. Correlations between CPR parameter settings and ECG characteristics were calculated. Results: Compression rate showed a low-to-moderate correlation (0.454) with change in MS in Phase I, however neither DC nor depth showed a correlation with either AMSa or MS. In the FSOVA models, MS differed between CPR groups at the end of Phase I (p = 0.046) but not AMSa, suggesting limited response of quantitative ECG measures after extended time intervals. Conclusions: In early chest compression rate in early phase CPR appeared to be related to quantitative characteristics of the VF ECG.
changed every 1.5 minutes. Results: At a rate of 125 CPR, CC delivered at a duty cycle of 45% generated 25% more flow in L/min of CC delivered at a duty cycle of 27% (0.157 ± 0.086 L/min vs. 0.275 ± 0.14 L/min, respectively). However at a rate of 50 CPR, blood flow was not dependent on duty cycle (45%: 0.045 ± 0.015, 27%: 0.037 ± 0.015). This relationship appeared to be conserved when blood flow was compared at the level of L per compression. Conclusions: The results of these experiments suggest that carotid blood flow is dependent on both rate and duty cycle. These data suggest that the dependence of CC generated flow on duty cycle cannot be ignored when determining the optimal rate and duty cycle.

77. REARREST EPISODES IN OUT-OF-HOSPITAL CARDIAC ARREST Amher Rice, Joshua Gaither, Daniel Spait, Vatsal Chikani, Sean Wentworth, Tyler Vadeboncoeur, Taylor George, Terry Mullins, Bentley University: University of Arizona Category of Submission: Cardiac Background: Limited out-of-hospital cardiac arrest (OHCA) studies have found that recent or return of spontaneous circulation (ROSC) is both common and independently associated with lower survival. To better understand prehospital rearrest after ROSC, we sought to describe recent and return of spontaneous circulation rhythms for adults with OHCA of presumed cardiac etiology in an expanded and more recent sample of OHCA's.

Methods: Cases were identified from September 2008 to December 2015 from three EMS systems in Arizona. Minute-by-minute post-ROSC and return of spontaneous circulation rhythms were grouped into Ubelstr categories by two emergency medicine trained physicians after analysis of continuous defibrillator ECG data (E Series, ZOLL Medical). Rearrest was defined as 1 minute of lethal arrhythmia or crew restarting CPR for any length of time, including loss of pulses. Descriptive statistics were used to describe the distribution of post-ROSC rhythms. Results: Of 1,603 adult OHCA patients, there were 409 cases of ROSC (25.5%) and 350 were included in this analysis. Cases were excluded if a specific cause of death was not determined (54). ROSC was not achieved prior to ED arrival (1,194) or adequate electrocardiograph (ECG) rhythm recordings were not available (23). There was a total of 4,099 minutes of ROSC (not including nearest) with 7 distinct post-ROSC rhythms. Sinus rhythms predominated after achieving ROSC, with sinus tachycardia representing the greatest percentage (52.15%) of all rhythms. A smaller percentage of minutes were seen of sinus rhythm (21.14%), sinus bradycardia (5.0%), V-tach (4.41%), idioventricular (6.91%), atrial fibrillation, flutter (1.88%), and junctional rhythms (1.31%). Almost half of ROSC patients in this sample (45%) sustained at least one episode of nearest and 22 patients (7%) sustained multiple rearrests. The most common nearest rhythms in this sample were pulseless electrical activity (62.3%) and VT/VF (32.6%).

Conclusions: This study demonstrates that near death flow was not dependent on duty cycle. Further investigation is warranted into the factors affecting near death flow in cases of ROSC in out-of-hospital OHCA. In this analysis, a wide variety of both post-ROSC and nearest rhythms were observed, which helps improve EMS protocols for nearest for rearrest and provides the potential for targeted interventions to prevent OHCA rearrest.

78. EFFECT OF EARLY DETECTION BY DISPATCHER ON SURVIVAL OUTCOMES AFTER OUT-OF-HOSPITAL CARDIAC ARREST

Seo Young Ko, Sang Do Shin, Kyong Jun Song, Ki Jeong Hong, Young Sun Ro, So Yeon Kong, Tae Hyeong Yoon, Sung Yoon Kim, Won Gyeong Kang, Sang Min Kang, Hyun Joon Seo, Ju Young Park, Daniel Davis, ZOLL Medical Category of Submission: Cardiac Background: Dispatcher-assisted cardiopulmonary resuscitation (DA-CPR) is an important intervention to improve outcomes of out-of-hospital cardiac arrest. We studied the association between fast detection of specific cardiac rhythms by dispatcher and outcomes in out-of-hospital cardiac arrest (OHCA).

Methods: We conducted a cross-sectional study. All adult OHCA's of presumed cardiac etiology and bystander witnessed between 2013 and 2015 were analyzed. The main exposure of interest was time from EMS call to detection of cardiac arrest by dispatcher. Patients with unknown time to detection by dispatcher or extremely longer detection time (>20 minutes), and unknown outcomes were excluded. Time to detection of cardiac arrest by dispatcher was classified into the early (0–90 seconds), middle (91–180 seconds), and late (181–1,200 seconds) groups. The primary outcome was survival to discharge and secondary outcome was good neurological recovery. Multivariable logistic regression analysis was performed, adjusting for patient, arrest, environmental, and dispatcher characteristics. Results: Of 83,083 OHCA's, 6,539 (7.9%) patients were instructed DA-CPR between 2013 and 2015. A total of 6,385 (7.7%) patients were enrolled, excluding cases with missing data on DA-CPR. The rates of DA-CPR performed were 28.7%, 43.0%, and 28.3% in early, middle, and late detection groups, respectively. Overall, survival to discharge occurred in 623 (9.9%) OHCA's and good neurological outcome was observed in 441 (6.9%) patients. After adjusting for potential confounders, longer time to recognize cardiac arrest was associated with increased odds of survival to discharge for both middle (AOR 0.74, 95%CI 0.59–0.91) and late groups (AOR 0.75, 95%CI 0.59–0.94) compared with early group. There was no significant association between recognition time and good neurological outcome [Middle vs Early AOR(95% CI): 0.81 (0.63–1.04), Late vs Early AOR(95%): 0.79 (0.60–0.93), Late vs Middle AOR(95%): 0.98 (0.76–1.26)]. Mortality status was significant effect modifier (p < 0.001). In non-metropolitan areas, compared with early group (95% CI) for survival to discharge was 0.65 (0.49–0.85) in the middle group, 0.68 (0.51–0.90) in the late group. In metropolitan areas, there was no significant association between recognition time and survival to discharge [Middle vs Early AOR (95% CI): 0.91(0.64–1.30), Late vs Early AOR(95%): 0.88(0.60–1.29)].

Conclusions: The shorter duration from the EMS call to recognition of cardiac arrest by dispatcher was associated with favorable outcomes after OHCA.

79. IMPACT OF REAL TIME CHEST COMPRESSION FEEDBACK INCREASES APLICATION WITH THE 2015 GUIDELINES

Kenan Kunstal, Tiffany Hoeye, Sara Wattenbarger, Stacie McAuley, Laurel Linder, Daniel Davis, ZOLL Medical Category of Submission: Cardiac Background: Cardiac arrest survival is dependent upon chest compression quality. Target parameters for compression depth and rate became more specific from the 2010 Guidelines [±2 inches, 80–120/min] to the 2015 Guidelines [≥3 inches, 100–120/min]. Real-time audiovisual feedback (RTAVF) may improve compression guideline adherence, but the impact of RTAVF with application of more specific target rates and depths has not been studied. We hypothesized that Dependence on RTAVF to achieve compression guideline adherence will increase with application of the more specific 2015 Guidelines.

Methods: Data were collected as part of a benchmarking program conducted at multiple U.S. hospitals. Compression data from 82,846 rescues were recorded using standard compression mannequins and RTAVF defibrillators (R Series, ZOLL Medical). The program included subjects enrolled before (n = 756) and after (n = 995) introduction of the 2015 Guidelines, with target compression parameters modified accordingly. At baseline subjects performed 2 continuous compressions with audio feedback disabled. After a brief RTAVF orientation, subjects repeated 2 min of continuous compressions with feedback enabled. The 2010 Guidelines cohort and 2015 Guidelines cohort were compared with regard to the percentage of compressions meeting appropriate rate/density targets with and without use of RTAVF.

Results: An increase in compression guideline adherence was observed with use of RTAVF for both the 2010 Guidelines cohort [40.3% to 96.0%, OR 15.9 (10.8–23.6), p < 0.01] and the 2015 Guidelines cohort [16.7% to 95.0%, OR 94.4 (67.9–131.2), p < 0.01]. The proportion of subjects requiring RTAVF to achieve adherence increased from the 2010 Guidelines cohort to the 2015 Guidelines cohort [36.1% vs. 79.3%, OR 6.8 (5.5–8.4, p < 0.01), OR 3% vs. 4.0%, OR 1.1 (0.7–1.7), p = 0.63] became nonadherent [30.4% vs. 10.0%, OR 2.6 (0.7–9.3) vs. 0.16] with RTAVF. Conclusions: The use of RTAVF increases adherence to chest compression guidelines, particularly with application of the more specific 2015 guidelines targets for compression depth and rate.

80. DIRECT TRANSFER TO COMPREHENSIVE STROKE CENTER MAY NOT EXPEDITE REPERFUSION OF LARGE VESSEL OCCLUSION STROKE

Ali Shams, Chris Kanaan, Rebbecca Grysiewicz, Chris Kazmierczak, Laura Steucher, Robert Swor, Beaumont Health Category of Submission: Student, Resident, Fellow Background: A body of knowledge has evolved that has demonstrated improved survival and functional outcome from LVO strokes with timely mechanical endovascular revascularization. To decrease time to care, EMS policy makers have begun to develop methods to identify and triage EMS LVO stroke patients directly to comprehensive stroke centers (CSC). The objective of this study was to assess whether time to definitive care for LVO stroke patients is decreased in patients who present directly to a CSC compared to patients who are transferred from a primary stroke center.

Methods: We performed a cohort study of patients admitted to a single suburban CSC (July 2015–December 2016) with a diagnosis of LVO stroke. Patients presented directly to the CSC, or were transferred by air or ground from a primary stroke center. Time intervals from arrival at either first hospital or CSC to interventional skin puncture (access) and reperfusion at the CSC were recorded. Transfer distance was calculated using Google Maps. Because we sought to assess impact of triage with use of regional EMS, all LVO stroke patients transferred within a 15-mile radius. Non parametric statistics were used for comparisons. Median and range are reported. Results: We included a total of 62 cases at the suburban CSC, with 54 transported within 15 miles. Of these, 25 patients were direct transports (15 via EMS and 10 via private car) and 29 were transferred from hospitals. Transferred patients had shorter times from CSC arrival to access and reperfusion [median, 30.5 (6–216) vs. 156 (30–246), p < 0.001, and 69 (25–
81. Benchmarking EMS Compass Cardiac Performance Measures Using a Large National Dataset

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nuddel, Williamson County EMS Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: Early defibrillation of shockable cardiac arrests, aspirin and 12 lead ECG, and a combination of nitroglycerin and non-invasive positive pressure ventilation (NIPPV) in acute decompen-sated heart failure have been shown to provide meaningful clinical benefit. There has not yet been work done to provide benchmarks on the performance of these based on large national datasets. We aim to describe national performance on these measures. Methods: Using a 6 1/2-year consecutive sample of records from 9-1-1 calling EMS agencies using ESQ Solutions electronic health record (EHR), we calculated compliance with the following performance measures: the average time from dispatch to first defibrillation in shock-able rhythms, the proportion of these provided within 5 minutes, the proportion of patients over 35 with non-traumatic chest pain who received both aspirin and a 12 lead ECG, and the proportion of patients with acute decompen-sated heart failure (ADHF) as defined by SBP > 200 and either a RR > 30 or an SpO2 < 90 who received both NTG and NIPPV. For times, we provide the average, median and interquartile rank. For proportions, we also calculated the 95% confidence interval. Results: Of 111,444 patients with an initial shockable rhythm, 1,630 or 14.6% (14.0–15.3%) were defibrilliated within 5 minutes. The average time to first shock was 13.65 min, IQR 9.0 (6.4, 13.2). Among those who completed the post-test questionnaire, 56% (n = 1125) were successful on the first attempt. Of those with no EMT experience prior to enrollment in an AEMT program, those with one to five years of experience had greater odds of passing (1.37, 1.10–1.71), while four or more years of EMT experience was not significantly associated with examination success (1.09, 0.84–1.42). Attending an AEMT program that required an entrance exam was not associated with odds of success (0.85, 0.69–1.05). However, respondents who were required by their program to complete a final course-ending cognitive examination exhibited higher odds of success compared to those who did not (2.18, 1.78–2.65). Compared to those who paid for their own exam, there was no difference in odds of passing for those whose employers (1.21, 0.99–1.49) or programs (1.16, 0.85–1.58) paid some/all of the exam fees. Conclusions: Prior EMT experience and program course-ending cognitive examinations were significantly associated with increased odds of success on the National AEMT Examination. Future work should examine the effect of program entry requirements and program curriculum composition on graduate performance.

82. Characteristics Associated with Success on the National AEMT Certification Examination

Madison Rivard, Rebecca Cash, Remle Crowe, Jeremy Miller, Ashish Panchal, The National Kosair Children's Hospital Medical Technical Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: Advanced emergency medical technician (AEMT) certification, the provider level between emergency medical technician (EMT) and paramedic, was first issued on a national level in 2011. While characteristics of examination success at other provider levels have been explored, little is known regarding the AEMT level. To examine the association between AEMT graduate characteristics and success on the National AEMT Cognitive Examination. We hypothesized that pre-test characteristics, gender, entrance exams, course-ending final exams, and exam fee payer would be associated with success.

Methods: We performed a cross-sectional evaluation of all post-test National AEMT Certification cognitive examination results from October 2016 to April 2017. Upon completion of the examination, a brief, voluntary questionnaire assessed AEMT candidates’ characteristics and experiences. Descriptive statistics were calculated, and the association between characteristics reported by graduates and success on the exam was assessed using univariable logistic regression models (OR, 95% CI). Results: In the study period, 3,835 AEMT graduates attempted the cognitive examination and 2,572 completed the post-test questionnaire (response rate 62%). Among those who completed the questionnaire, 56% (n = 1125) were successful on the first attempt. Of those with no EMT experience prior to enrollment in an AEMT program, those with one to five years of experience had greater odds of passing (1.37, 1.10–1.71), while four or more years of EMT experience was not significantly associated with examination success (1.09, 0.84–1.42). Attending an AEMT program that required an entrance exam was not associated with odds of success (0.85, 0.69–1.05). However, respondents who were required by their program to complete a final course-ending cognitive examination exhibited higher odds of success compared to those who did not (2.18, 1.78–2.65). Compared to those who paid for their own exam, there was no difference in odds of passing for those whose employers (1.21, 0.99–1.49) or programs (1.16, 0.85–1.58) paid some/all of the exam fees. Conclusions: Prior EMT experience and program course-ending cognitive examinations were significantly associated with increased odds of success on the National AEMT Examination. Future work should examine the effect of program entry requirements and program curriculum composition on graduate performance.

83. Change in Quantitative Ventricular Fibrillation Over Bouts of Chest Compressions in CPR

Matthew Sündemann Sundemann, David Salcido, James Menegazzi, Department of Emergency Medicine, University of Pittsburgh School of Medicine Category of Submission: Student, Resident, Fellow

Background: Chest compressions (CC) given during cardiac arrest generate blood flow to the brain and other vital organs, but the effect of CC is dependent on their performance characteristics. Quantitative electrocardiography (QECG) features of the ventricular fibrillation (VF) waveform correlate with myocardial perfusion levels during cardiac arrest and therefore may be a good quality metric. We hypothesized that there would be an association between change in QECG measures and CC characteristics. Methods: CC process metrics from defibrillator downloads obtained from the continuous chest compression (CC) trial of the Resuscitation Outcomes Consortium (ROC). Cases were included if they had at least one defibrillator file with a bout of CC bounded by analyzable ECG signal segments, and amounted to 25,210 cases without any baseline unique cases. For each bout, the QECG measures AMSA, MS, LAC, and DFA were calculated for the starting and ending ECG segments around the bout, and CPR performance metrics (nt, 1.10–1.71), while four or more years of EMT experience was not significantly associated with examination success (1.09, 0.84–1.42). Attending an AEMT program that required an entrance exam was not associated with odds of success (0.85, 0.69–1.05). However, respondents who were required by their program to complete a final course-ending cognitive examination exhibited higher odds of success compared to those who did not (2.18, 1.78–2.65). Compared to those who paid for their own exam, there was no difference in odds of passing for those whose employers (1.21, 0.99–1.49) or programs (1.16, 0.85–1.58) paid some/all of the exam fees. Conclusions: Prior EMT experience and program course-ending cognitive examinations were significantly associated with increased odds of success on the National AEMT Examination. Future work should examine the effect of program entry requirements and program curriculum composition on graduate performance.

84. The Utilization of a Province Wide EMS System by Children and Youth with Mental Health Complaints

Aaron DeRosa, Michael Zhang, Judah Goldstein, Carl Jarvis, Md Shamsuzzaman, University of Prince Edward Island, Atlantic Regional Training Centre Category of Submission: Student, Resident, Fellow

Background: Children and youth Emergency Department (ED) and hospital based mental health(MH) service use is increasing in Canada and the United States. This may extend to the EMS setting. Our objective was to describe trends and characteristics of EMS utilization by children and youth with MH complaints. Methods: We conducted a retrospective popula-tion based quantitative descriptive study, using secondary data from the provincial EMS database. Results: 5 to 18 who utilized EMS for MH related complaints between 2010 and 2015, inclusive, were used in the analysis. We described prevalence, demographics, and oper-ational characteristics. MH calls were based on chief complaint or clinical impression relating to MH and resemble the Canadian ED short list of Diagnosis under Mental and Behavioural Disorders. Continuous and discrete variables were reported as n, mean, SD; Categorical as n, %. Results: Our electronic query retrieved 16,169 EMS responses for children and youth; of which 2108(16%) were related to MH. The mean age was 11.6 (9.4–14.9) and most MH calls were females (n = 1238, 59%). There was a 27% increase in total MH calls over the 6 year study period compared to a 9% increase in all EMS calls in the same age group. Females had the largest increase (47%) in MH related complaints over the study period. The major-ity of patients were single users (n = 1436, 68%), whereas, 180 repeat users accounted for 503(24%) responses, ranging from 2–3 incidents over the study period. Most patients were transported (n = 1920, 91%). The two most common conditions addressed by paramedics were overdose/poisoning (n = 1747, 83%), and depressed/suicide (n = 250, 12%). Anxiety (n = 235, 11%) was the second most prevalent comorbidity, followed by Attention-Deficit Disorder/ Hyperactivity Disorder (n = 207,28%). When categorizing patients over a calendar year 1045 patients were low users (1 call per year), 689 patients were medium users (2-4 calls per year), 8 patients were high users (5–14 calls per year). Conclusions: We observed an increasing trend in EMS use for MH complaints by children and youth. The majority of patients are transported by paramedics to the ED. This trend should be considered when developing EMS policies, programs, and training for paramedics.
Background: The use of push dose epinephrine (PDE) is becoming increasingly common in the treatment of profound hypotension in the prehospital setting. However, no quantitative research has analyzed the patient populations receiving this treatment. We aim to describe the population of patients treated with PDE as compared to hypotensive patients not treated with PDE.

Methods: We performed a retrospective cohort study to describe the use of PDE in a critical care transport system. We evaluated the use of PDE for management of prehospital hypotension from January 2015 to April 2017. We reviewed prehospital and in-hospital medical records for patients treated and compared to historical controls identified using a multi-state air medical service that incorporated PDE into its protocols (epinephrine 100 mcg IV/IO every 2 min for SBP < 70 mmHg or peri-arrest state). Patients were categorized by hypotension and met inclusion criteria for PDE use in the current protocol. We compared pretreatment characteristics and vital signs for patients following SBP < 70.

Results: Of 294 OHCA events treated by a single provider within a system of care, 62% was calculated based on successful delivery on a text message alert intervention compared with historical control group.

Conclusions: Text message alerts for bystander CPR and survival outcomes after OHCA were conducted with resuscitation attempted OHCA between 2014 and 2015 in the study districts of Seoul, South Korea. Seoul implemented a TM alert system as a community intervention in May, 2015. The intervention group was defined as OHCA cases that occurred from May to December in 2015, and the historical control group was defined from the same period (May to December) in 2014. Endpoints were bystander CPR rate and survival to discharge. Multivariable logistic regression analysis was used to evaluate the effect of TM alert intervention compared with historical control group. Results: A total of 1,124 OHCA were analyzed, with 560 OHCA cases in the intervention group and 564 OHCA cases in the historical control group. Bystander CPR performed in 141 patients (25.1%) in 2014 and 119 patients (21.3%) in 2015 (p-value = 0.14). Survival to discharge was observed in 31 patients (5.5%) in 2014 and 56 patients (10.5%) in 2015 (p-value = 0.14). The odds ratios (95% CI) of bystander CPR and survival to discharge for intervention group compared to control group were 0.80 (0.60 to 1.06) and 0.94 (0.57 to 1.54), respectively.

Conclusions: The text message alert system for CPR trained citizens was not associated with a significant increase in bystander CPR and survival to discharge rates.

Background: Bystander cardiopulmonary resuscitation (CPR) is a key factor to improve survival outcomes in out-of-hospital cardiac arrest (OHCA) patients. TM alert system for trained citizens was implemented to increase bystander CPR in the community. This study aimed to determine the effects of a TM alert on bystander CPR rate and survival outcomes after OHCA.

Methods: A before-after population based study was conducted with resuscitation attempted OHCA between 2014 and 2015 in the study districts of Seoul, South Korea. Seoul implemented a TM alert system as a community intervention in May, 2015. The intervention group was defined as OHCA cases that occurred from May to December in 2015, and the historical control group was defined from the same period (May to December) in 2014. Endpoints were bystander CPR rate and survival to discharge. Multivariable logistic regression analysis was used to evaluate the effect of TM alert intervention compared with historical control group. Results: A total of 1,124 OHCA were analyzed, with 560 OHCA cases in the intervention group and 564 OHCA cases in the historical control group. Bystander CPR performed in 141 patients (25.1%) in 2014 and 119 patients (21.3%) in 2015 (p-value = 0.14). Survival to discharge was observed in 31 patients (5.5%) in 2014 and 56 patients (10.5%) in 2015 (p-value = 0.14). The odds ratios (95% CI) of bystander CPR and survival to discharge for intervention group compared to control group were 0.80 (0.60 to 1.06) and 0.94 (0.57 to 1.54), respectively.

Conclusions: The text message alert system for CPR trained citizens was not associated with a significant increase in bystander CPR and survival to discharge rates.
Morristown Medical Center

Is Prehospital Epinephrine Used with CI.

Methods: It is administered correctly for anaphylaxis. In adults with OHCA, more prehospital providers, parents, and school nurses are being trained to diagnose and treat anaphylaxis in pediatric patients. More education is needed to recognize this disease process and treat it appropriately.

Conclusions: In adults with OHCA, use of a mechanical CPR device was associated with higher proportion of time within the target CC rate during all time periods. Use of mechanical CPR may improve CPR quality without exposing providers to the risks of performing manual CPR during the packaging, loading, and transport of OHCA patients.

90. Is Prehospital Epinephrine Used Appropriately in Pediatric Anaphylaxis?
Joslyn Joseph, Brian Walsh, David Feldman, Morristown Medical Center Category of Submission: Pediatric

Background: Anaphylaxis is an acute, life-threatening condition that requires immediate recognition and treatment. The goal of therapy should be prevention and treatment of anaphylaxis with epinephrine to prevent progression to life-threatening respiratory compromise or cardiovascular collapse. More prehospital providers, parents, and school nurses are trained in using epinephrine. We sought to determine how often epinephrine is used in children and, more importantly, how often it is administered correctly for anaphylaxis.

Methods: Setting: A suburban two-tiered EMS system in which ALS units evaluate approximately 85% of the prehospital encounters and transport. Mechanical CPR was performed using AutoPulse® (ZOLL Medical®), while most cases of manual CPR were performed with real-time audiovisual feedback [Real CPR Help®]. Manual CPR [metronome rate of 100 beats per minute (bpm)] and mechanical CPR [set CC rate of 80 bpm] were compared by the median proportion of time in which CC rate was within ±5 bpm of the target range (pCCr) and the mean CCf is reported using the Wilcoxon rank-sum test. Results: 357 cases were reviewed and 239 excluded: no age or <18 years (6), medical or unknown location (31), non-cardiac etiology (87), data unavailable (115), leaving 118 included. No significant difference in CCf was noted between the two groups during transport (p = 0.47). In cases with mechanical CPR, CCr was higher during packaging 85.0 vs. 74.5 (p = 0.0043) and loading 86.0 vs. 80.0 (p < 0.0001), and (0.5 vs. 0.0002). Conclusions: In adults with OHCA, use of a mechanical CPR device was associated with higher CC rate during patient packaging and transport, and higher proportion of time within the target CC rate during all time periods. Use of mechanical CPR may improve CPR quality without exposing providers to the risks of performing manual CPR during the packaging, loading, and transport of OHCA patients.

91. Pediatric Out-of-Hospital Cardiac Arrest Outcomes before and after Implementation of a Standardized Resuscitation Tool
Scott Alter, Lisa Clayton, Richard Paley, Richard Shih, Florida Atlantic University Category of Submission: Pediatric

Background: Pediatric out-of-hospital cardiac arrest (POHCA) occurs infrequently, yet requires the same level of care provided to adults. Therefore, it is imperative that prehospital providers are prepared to rapidly treat POHCA. To meet this need, pediatric-specific tools have been developed. This study compares POHCA outcomes before and after implementation of an age-based resuscitation tool.

Methods: Design: Retrospective chart review. Setting: County-based ALS service with 87,000 calls per year, covering a population of 635,000 over 2,000 square miles. Subjects: Patients from January 1, 2012 and December 31, 2016. On January 1, 2014, a commercial tool for POHCA, consisting of age-based medication dosing protocols, was implemented. Rates of ROSC, survival to hospital admission, and survival to hospital discharge, were calculated and compared between the pre-implementation and post-implementation groups. Results: A total of 132 POHCA patients were identified, of whom 24 had ROSC before EMS arrival. The remaining 108 patients had average age of 1.6 years, with similar baseline characteristics between groups. In the two years prior to tool implementation (control group), there were 37 cardiac arrests. Of these, 2 had ROSC after EMS arrival and none survived to hospital admission. In the three years after implementation (experimental group), there were 71 cardiac arrests. Of these, 13 had ROSC after EMS arrival. All patients with ROSC survived to hospital admission and 3 survived to hospital discharge. Between the control and experimental groups, there was a 13% difference in ROSC after EMS arrival (5% vs. 18%; 95% CI: 0.01–0.24), 18% difference in hospital admission (0% vs. 18%; 95% CI: 0.06–0.29), and 4% difference in overall survival to discharge (0% vs. 4%; 95% CI: -0.06–0.12).

Conclusions: After implementation of an age-based resuscitation tool, there was a statistically significant increase in POHCA survival to hospital admission. ROSC rate obtained after EMS arrival and survival to hospital discharge also increased, though failed statistical significance. Based on these results, EMS agencies may consider implementing an age-based resuscitation tool as part of a strategy to improve POHCA treatment.

92. Comparison of Commercial Tourniquets in a Pediatric Trauma Patient Model

James Vreth, Center for Tactical Medicine Category of Submission: Pediatric

Background: Young children and adolescents are frequently injured in peacetime and wartime. Reviews of trauma registries at U.S. military medical facilities during the Iraq and Afghanistan conflicts show that as the age of a child decreases the injury severity and mortality increases. Tourniquets are used for control of extremity hemorrhage in adult trauma patients is associated with increased survival with only minimal tourniquet associated morbidity. Use of commercial tourniquets designed for adults when applied to pediatric patients of different ages.

Methods: The institutional Ethics Review Board approved the study. The study was a prospective and non-blinded test of nine commercial tourniquets on a pediatric arm hemorrhage test model using six sized mannequins to simulate a “tourniquet patellar wrap and tuck” (SWAT), TaMed K9 (TMK9), and Rapid Application Tourniquet System (RATS) tourniquets apply compressive forces by elastic recoil or manual application via strap.

Results: None of the tourniquets achieved the class to increase circumferential compression by decreasing strap length. The Child Ratcheting Medical Tourniquet (CRMT) uses a ratchet and ladder mechanism to increase circumferential compression. The Mechanical Advantages Tourniquet (MAT) has a turnkey apparatus mounted on a fixed length C-shaped housing that pulls a portion of the retaining strap into the housing as a mechanism to increase circumferential pressure. The SWAT, TMK9 and RATS were successful stopping the flow of water on all sized mannequins. The CRMT was the only mechanical advantage tourniquet that was successful in stopping fluid flow on all mannequin sizes. The TMF and SOFTTW started failing on mannequins with 6.35 cm diameters. The CAT, SAMXT, TM, and SOFTTW all failed on the 5.08 cm diameter mannequin. The MAT failed on the 7.62 and 9.53 cm diameter mannequins.

Conclusions: We have shown that many commercially available tourniquets do not stop fluid flow in our pediatric arm hemorrhage test model.

93. Prehospital Blood Pressure Measurement in Major Traumatic Brain Injury: Concordance Between EMS Provider Documentation and Non-invasive Monitor Data Tracking
OCTAVIO PEREZ, OCTAVIO PEREZ, ERIC HELFENBEIN, BRUCE BARNHART, SABED BABAIEZADEH, DAWN JORGENSEN, CHENGCHENG HU, VAASYL CHIKAN, JOSHUA GAILTHIER, SAMANTHA BECHT, THE GRILL, DANIEL SPAITE, UNIVERSITY OF ARIZONA CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS, DISASTER, DISASTER

Background: Recent studies have shown that the lowest prehospital systolic blood pressure (SBP) is strongly associated with mortality across a remarkably wide range (far above 90 mmHg) in traumatic brain injury (TBI). Furthermore, in TBI research, case ascertainment and risk stratification is dependent upon documentation of prehospital BP. Objective: To identify the concordance between the lowest SBP documented by EMS personnel in patient care records (PCR) and the recorded non-invasive monitor data in TBI.

Methods: A subset of major TBI cases (moderate/severe; CDC Barnell Matrix 3) in the EMT EBS TBI Study (NIH 1R01NS071049) were...
evaluated (3/13–3/17). Cases from 6 EMS agencies that report continuous monitor data (Philips MRx®) as part of EPIC were included. All cases for this period review were displayed and accessible to the providers during EMS care. We compared the lowest PCR-documented SBP to the monitor-recorded value in each patient. Results: 125 cases were included (median age: 52, 65% male). In 96 cases (72.7%), the lowest PCR-documented SBP was exactly concordant with the lowest monitor-syndrom. When concordance was defined by the difference being ≤5 mmHg, 113 (85.6%) were concordant. Among the 16 patients with guideline-defined hypotension identified by the monitor (<90 mmHg) only 11 (68.8%) were documented in the PCR. Conclusions: Significant disparities were identified between the lowest monitor-recorded SBP and the PCR-documented value. Furthermore, PCRs failed to identify one third of monitor-documented hypotension. This may be explained, in part, by ongoing care responsibilities and scene distractions that may cause providers to miss BP readings. Our findings identify a potential hidden contributor to poor outcomes, which goes unrecognized and, untreated, rather than simply not being documented. Furthermore, case ascertainment, confounding, and risk-adjustment in TBI studies has not been controlled. Whether possible, quality improvement and research projects should utilize monitor data to identify and evaluate hypotensive TBI patients. Future development of monitor-based real-time audiovisual feedback technology might improve provider identification of hypotension.

94. EVALUATING THE GENDER GAP IN EMTS AND PARAMEDICS OBTAINING NATIONAL EMS CERTIFICATION FROM 2007 TO 2016
William Krebs, Remle Crowe, Rebecca Cash, Madison Rivard, Ashley Larrimore, Christine Hamilton, Ashish Panchal, Paula Miller, Regions Hospital Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: With roots in battlefield medicine and the fire service, the EMS workforce has traditionally been comprised of mostly male providers. However, the gender composition has changed in both prominence and function, it is unknown how the gender composition of the workforce has changed on a national level. The objective of this study was to evaluate the effectiveness of a fire-based community paramedic (CP) program on CHF management in patients recently discharged from the hospital using the Minnesota Living with Heart Failure® Questionnaire (MLHF). We hypothesize that CP visits will contribute to improvement in the patient’s quality of life as assessed by the MLHF. Methods: Patients with a CHF-related hospitalization who provided consent to participate in the CP program completed the MLHF prior to discharge. The CP program entailed weekly home visits from a CP. The MLHF is a validated questionnaire that uses a Likert scale to measure the effects of CHF symptoms, functional limitations, and psychological distress. Each symptom is rated on a 0–5 scale, with a score of 5 corresponding to the greatest detriment to quality of life (QOL). Total MLHF scores range from 0–105, 4–5 indicating the worst possible health. In this study, patients repeated the MLHF pre/post survey scores were analyzed descriptively using means and standard deviations. Scores were assessed with Wilcoxon signed-rank dimensions: total score, emotional symptoms, and physical symptoms. Results: Twenty-three patients completed the pre- and post-tests from March 2015 to May 2017. The mean total scores on the pre-assessment (score = 57.83, SD = 28.09) and post-assessment (score = 45.30, SD = 30.77) were significantly different (p = 0.022). Mean pre-score for physical assessment questions was 25.78 (SD = 12.06) while on the post assessment it was 21.22 (SD = 11.66). Mean of the emotional score on the pre-assessment was 12.17 (SD = 8.53) while on the post assessment it was 9.96 (SD = 8.84). Total scores were significantly different between the pre and post assessments (p = 0.0216). Scores for the physical questions of the assessment were significantly different between the pre and post assessments (p = 0.0218). The pre-post difference in emotional score was not different (p = 0.11). Conclusions: Using the MLHF, we found significant improvement in QOL of CHF patients who completed the CP program. This study is limited by the small sample but the data encouraging improvements to this patient population.

95. IMPACT OF COMMUNITY PARAMEDIC HOME VISITS ON CHF PATIENTS: A PRE-POST STUDY
Rebecca Cash, Evon Crowe, Remle Crowe, Madison Rivard, Anne Knorr, Ashish Panchal, Douglas Kupas, National Registry of Emergency Medical Technicians Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: Recent crash testing shows EMS professionals are at high risk of injury on the scene, while riding in an ambulance, yet seatbelt use is reportedly low. Variation in seatbelt use based on seating location and patient acuity is unknown. Our objectives were to describe the prevalence of seatbelt use by seating location and identify factors associated with seatbelt practices. We hypothesized that seatbelt use would be low in the patient compartment regardless of presence of a patient, seating position, or patient acuity. Methods: We analyzed a cross-sectional electronic questionnaire administered to a random sample of nationally-certified EMS professionals. Respondents reported frequency of seatbelt usage in the prior 12 months. Inclusion criteria consisted of practicing EMS professionals or being in a non-military setting who work in ambulances. We defined consistent seatbelt use as reporting frequency of use >50% of the time in a seating location. Denominators reported to respondents were being utilized in the specific seat. Multivariable logistic regression (OR, 95%CI) using an investigator-controlled backwards selection process was used to assess characteristics associated with wearing a seatbelt on the crew bench while transporting patients. Results: A total of 1,431 responses met inclusion criteria (response rate = 11.4%). Most respondents were men, with a median age of 37 years (97%, n = 1,181/1,221). In the patient compartment without a patient being transported, consistent seatbelt use was poor regardless of seat position (p = 0.06). In the face-down position (60% [n = 49/82], rear-facing airway/jump seat: 59% [n = 67/113], crew bench: 36% [n = 362/1,097]). During patient transport, consistent seatbelt use on the crew bench was reported at 23% with stable patients and 11% with critical patients. Factors associated with increased odds of seatbelt use on the crew bench when transporting a critical patient (lowest seatbelt use) included having a company policy for seatbelt use (6.25, 4.06–9.60) and EMS providers with a higher level of expertise (95%, AEMT/Paramedic), controlling for years of experience. Conclusions: Seatbelt use by EMS personnel in the patient compartment was low and varied by seat and patient acuity, with use highest in forward-facing seats. Seatbelt use was lowest in the patient compartment during the potentially more hazardous transport of critical patients. Future work should examine ways to increase seatbelt use in the patient compartment.

96. SEATBELT USE BY AMBULANCE PERSONNEL IN THE PATIENT COMPARTMENT IS LOW REGARDLESS OF PATIENT PRESENCE, SEATING POSITION, OR PATIENT ACUTY
Heather Ellis, David Chase, Ventura County Fire Department Category of Submission: Cardiac

Background: Manual active compression decompression CPR (ACD CPR) with ITD (impedance threshold device) in supine position has shown improved outcome in out-of-hospital cardiac arrest. Automated ACD CPR with ITD in a thirty-degree head up position (HUP) has shown improved cerebral perfusion in porcine and human cadaver models. There is controversy regarding the ability to perform high quality manual ACD CPR in HUP. Objective: The primary purpose of this study was to perform a recording simulation mannequin in HUP. After brief instruction and practice using the Zoll ResQPUMP®
system continuous ACD CPR was started by a three-member first response team. The compression rate was considered high quality CPR. After 200 compressions there was a break to switch compressors. The CPR feedback from the mannequin and the ResQPCRTM system was recorded looking at depth, compression and decompression negative pressure (>10 kg); 80% beat-to-beat compliance for depth and decompression and an average rate between 75–85/min was considered high quality CPR. Zoll recommends a rate of 80/min for this system. After completion of 15–20 minutes of simulated manual ACD HUP CPR the team members were asked to complete a survey to assess the degree of fatigue and muscle strain they experienced in comparison to standard CPR. Results: 5984 separate compressions were rendered. Mean (SD; 95% CI) rate was 78.1 (9.6; 75.8–80.6)/minute and mean depth was 2.16 (0.07; 2.14–2.19) inches. 30 separate 200 compression efforts were analyzed for beat-to-beat compliance for depth and decompression. Mean depth compliance was 78.6% (6.08%; 75.8–81.3%). Mean decompression compliance was 91.4% (1.1%; 88.0–94.8%). 10 of 10 study responses to the simulated manual ACD CPR were no information on survival to discharge. Five studies had survival to discharge statistics; 73 (37.4%) obtained ROSC and from the scene using RLS was determined, along with 95% confidence intervals. Results: There were 7,709,012 9-1-1 calls that resulted in transport to and from the scene using RLS was determined, along with 95% confidence intervals. Results: There were 7,709,012 9-1-1 calls that resulted in transport to and from the scene using RLS was determined, along with 95% confidence intervals. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset. Methods: Using a large national dataset.

98. TELEVISION AND FILM DEPICT UNREALISTIC RATES OF CARDIAC ARREST SURVIVAL

Johanna Innes, Brian Clemency, Maxwell Diddams, Peter Natalizia, Deborah Waldrop, University at Buffalo

Background: The media’s portrayal of cardiac arrest management and outcomes may shape public perception of a cardiac arrest victim’s chance of survival. We sought to determine the accuracy of cardiac arrest survival depicted on television and film. We hypothesize that the survival rates portrayed on television and in movies were significantly higher than actual cardiac arrest survival rates. This may lead to unrealistic expectations regarding out of hospital cardiac arrest victims’ chances of survival in the general public.

Hypothesis: The media’s depiction of cardiac arrest survival often does not include survival to discharge information. When television and film studies are not included, they are significantly greater than actual cardiac arrest survival rates. This may lead to unrealistic expectations regarding out of hospital cardiac arrest victims’ chances of survival in the general public.

99. BENCHMARKING THE USE OF RED LIGHTS AND SIRENS IN 9-1-1 SYSTEMS: A REVIEW OF A LARGE, NATIONAL DATASET

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nudell, Williamson County EMS Committee of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: The use of Red Lights & Sirens (RLS) in response to and from the scene of a 9-1-1 call has long been tradition in EMS, although with limited evidence of clinical efficacy. There is a growing body of evidence of the dangers of RLS responses to 9-1-1 calls. The objective is to assess the necessity of RLS response from the scene.

Methods: High quality manual ACD HUP CPR can be done; however, it is more fatigueing and causes more muscle strain than standard CPR.

Conclusions: The media’s portrayal of cardiac arrest resuscitation was considered. Patients were included if they were resuscitated from out-of-hospital cardiac arrest (OHCA). In this study, we evaluate whether initial blood glucose level in OHCA patients is associated with poor outcomes in patients resuscitated from OHCA. The importance of diabetes is much higher than the national average (14.2% vs. 9.3%).

Background: Elevated blood glucose is associated with poor outcomes in patients resuscitated from out-of-hospital cardiac arrest (OHCA). In this study, we evaluate whether initial blood glucose level in OHCA patients is associated with poor outcomes in patients resuscitated from OHCA. The importance of diabetes is much higher than the national average (14.2% vs. 9.3%).

Background: Utilizing a “one dose epinephrine” protocol will improve neurological recovery. There-fore, we hypothesize that the administration of epinephrine every 3–5 minutes has been a component of the standardized protocol for treatment of cardiac arrest, yet recent studies suggest that the current dosing frequency of high-acuity 9-1-1 calls is possible that it is the 76% of RLS responses to 9-1-1 scenes could safely be decreased with appropriate priority dispatch protocols. Further efforts using patient outcome should assess the necessity of RLS response from the scene.

100. USEFULNESS OF EPISTRESSHINE IN CARDIAC ARREST

James Hehl, Matthew Wells, Beth Langley, JE Winslow, Cape Fear Valley Mobile Integrated Healthcare Cumberland County EMS Committee of Submission: Cardiac

Background: The landscape for treatment of cardiac arrest is evolving. The importance of prompt, high quality cardiopulmonary resuscitation and early defibrillation is receiving more emphasis. For decades, intravenous (IV) administration of epinephrine every 3–5 minutes has been a component of the standardized protocol for treatment of cardiac arrest, yet recent studies suggest that the current dosing frequency of high-acuity 9-1-1 calls is possible that it is the 76% of RLS responses to 9-1-1 scenes could safely be decreased with appropriate priority dispatch protocols. Further efforts using patient outcome should assess the necessity of RLS response from the scene.

Hypothesis: Utilizing a “one dose epinephrine” protocol will improve neurological recovery in survivors of cardiac arrest.

Methods: The protocol was revised and implemented in February of 2017 to include one IV dose of epinephrine. All other components of the cardiac arrest protocol where unchanged and followed the ACLS algorithm. Each patient was closely followed through a Quality Assurance and Quality Improvement process. Data was compared from February through July 2016, with epinephrine administered once. While we are unable to assess the necessity of RLS responses to 9-1-1 calls in patients. Of these, 5,846(38) (75.8%; 75.8–75.9%) involved RLS response to the scene and 1,494,378 (19.4%, 19.4–19.4%) resulted in RLS response from the scene to the hospital. Conclusions: Using a large national dataset, we provided baseline information on the prevalence of the use of RLS to and from 9-1-1 calls. We are unable to assess the necessity of RLS responses to 9-1-1 scenes could safely be decreased with appropriate priority dispatch protocols. Further efforts using patient outcome should assess the necessity of RLS response from the scene.

Conclusions: The media’s depiction of cardiac arrest resuscitation was considered. Patients were included if they were resuscitated from out-of-hospital cardiac arrest (OHCA). In this study, we evaluate whether initial blood glucose level in OHCA patients is associated with poor outcomes in patients resuscitated from OHCA. The importance of diabetes is much higher than the national average (14.2% vs. 9.3%). Data from January 1, 2016 through August 15, 2016 was analyzed. Patients were included in the study if the following variables were available: age, gender, initial blood glucose level, and outcome (no ROSC vs. ROSC). Patients were excluded if age < 17, no age, gender, or initial blood glucose level recorded, multiple blood sugars crossing 200 mg/dL, or no outcome recorded. Only the initial blood glucose obtained at the onset of resuscitation was considered. Patients were divided into two groups: blood glucose < 200 mg/dL and blood glucose > 200 mg/dL. A t-test was used to analyze continuous variables and a χ2 test was used to analyze categorical variables.

Results: 620 patients were included in this study. Mean age was 64.23 ± 17.20 years with 385 males (62.10%). 453 patients (73.0%) had initial blood glucose level in OHCA patients is associated with poor outcomes in patients resuscitated from OHCA. The importance of diabetes is much higher than the national average (14.2% vs. 9.3%).

Background: Utilizing a “one dose epinephrine” protocol will improve neurological recovery in survivors of cardiac arrest.

Methods: The protocol was revised and implemented in February of 2017 to include one IV dose of epinephrine. All other components of the cardiac arrest protocol where unchanged and followed the ACLS algorithm. Each patient was closely followed through a Quality Assurance and Quality Improvement process. Data was compared from February through July 2016, with epinephrine administered once. While we are unable to assess the necessity of RLS responses to 9-1-1 calls in patients. Of these, 5,846(38) (75.8%; 75.8–75.9%) involved RLS response to the scene and 1,494,378 (19.4%, 19.4–19.4%) resulted in RLS response from the scene to the hospital. Conclusions: Using a large national dataset, we provided baseline information on the prevalence of the use of RLS to and from 9-1-1 calls. We are unable to assess the necessity of RLS responses to 9-1-1 scenes could safely be decreased with appropriate priority dispatch protocols. Further efforts using patient outcome should assess the necessity of RLS response from the scene.
limitation to this study was that the patient population was restricted to San Antonio, Texas. Due to this, we only considered the initial blood glucose obtained during the resuscitation.

102. Implementing a Prehospital Protocol to Treat Behavioral Emergencies with Midazolam Leads to Effective Control of Agitated Patients

Christopher Richards, Ryan Huebinger, Katie Talata, Joseph Schenk, Kenneth Pearman, Eddie Maca, Matthew Strizlka, Mark Leslee Stein-Spencer, Leslie Zun, Northwestern Feinberg SOM Department of Emergency Medicine and Center for Injury Studies, Chicago. EMS System Category of Submission: Medical

Background: Combative patients are commonly encountered by EMS providers and pose challenges for both patient care and provider safety. Chemical sedation with midazolam is commonly used in the emergency department setting to treat agitation from psychiatric disturbances and intoxication. However, limited data exist regarding midazolam use in the prehospital setting. We hypothesize that implementation of a prehospital protocol using midazolam to treat patients having a behavioral emergency leads to improved clinical conditions without causing significant clinical deterioration. Methods: We performed a retrospective review of EMS records following the implementation of a behavioral emergen[cies protocol in a large urban EMS system from February 2014 through April 2016. Paramedics were instructed to administer midazolam 1 mg intravenous (IV) or intranasal (IN) or 5 mg intramuscular (IM) or intranasal (IN), repeating once as needed, and to record the response to treatment. Patients receiving midazolam for the indication of “behavioral emergency” were included, and any patient receiving midazolam for “seizure” were excluded. Descriptive statistics were used to report results, and Spearman’s rho was calculated to determine correlation of data for final analysis. Results: A de-identified database was generated of patients undergoing midazolam administration in 435 instances to 390 patients. Median age was 33 (IQR 24–50) years; 69.0% were male, and 53.1% were African American. Of the 435 patients, 1 mg (11.8%), 5 mg (72.3%), and 10 mg (15.1%) via IM (42.2%), IN (41.1%), IV (16.5%), and IO (0.2%) routes. In 37 patients, a second dose was required, and the same dose (rho = 0.84, p < 0.0001) and route (rho = 0.68, p < 0.0001) as the first administration was common. Paramedics reported slight or substantial improvement in clinical conditions worsened after midazolam administration.

103. Termination of Resuscitation Checklist: Duration and Outcomes of Resuscitation

Katherine Kuebler, Aurora Lybeck, Thomas Grawe, M. Riccardo Colella, Medical College of Wisconsin Category of Submission: Student, Resident, Fellow

Background: Checklists are often used in medical and non-medical fields to aid in error prevention, management of complex processes, and to help produce reliable outcomes. On April 1, 2016, the Termination of Resuscitation (TOR) checklist was implemented for use during out-of-hospital cardiac arrests (OHCA) by Milwaukee County Emergency Medical Services (EMS). Midazolam significantly improves survival, enhancing the patient’s chance of recovery. In this study, we evaluated the impact of a TOR checklist on clinical outcomes of OHCA. Hypothesis: We hypothesized that implementation of a TOR checklist would improve outcomes of OHCA. Methods: We performed a retrospective review of EMS records following the implementation of a TOR checklist in Milwaukee County EMS from April 1, 2015 to September 30, 2015 (452 medical, 44 trauma) and April 1, 2016 to September 30, 2016 (482 medical, 71 trauma). Outcome measures were set to be ROSC during resuscitation and presence of ROSC at hospital admission. Analysis of the data was done using t-tests. Results: In medical OHCA, incidence of ROSC during resuscitation increased from 41% (185/452) to 46% (220/482) with implementation of the TOR checklist. ROSC at hospital arrest arrival increased from 35% (160/452) to 40% (191/482). There was also a significant (p < 0.001) increase in mean duration of resuscitation (95.8 ± 34.2 minutes) after the checklist was implemented in cases of medical OHCA. Conclusions: In medical OHCA the use of a TOR checklist by OLMC significantly increased the duration of both resuscitations and OLMC time. The rates of ROSC during resuscitation and at hospital arrival increased after the checklist was implemented for medical OHCA. These results show a potential clinical benefit for OLMC use of a TOR checklist for medical OHCA, and also inform resource utilization in an academic Emergency Department. In traumatic OHCA there were no significant changes in duration of resuscitation or OLMC time and there was a decrease in ROSC; further study with a larger sample size may be needed. Neurological outcomes are unknown and further research may provide a better understanding of the impact of these findings.

104. Qualitative Evaluation of Community Paramedic Care Transitions Intervention Coach Training

Hunter Lau, Matthew Hollander, Jeremy Cushman, Amy Kind, Courtney Jones, Michael Lohmeier, Manish Shah, University of Wisconsin School of Medicine and Public Health Category of Submission: Student, Resident, Fellow

Background: The Care Transitions Intervention (CTI) has potential to improve the emergency department (ED)-to-home transition for older adults. Community paramedics may function as the CTI coaches instead of nurses who traditionally serve in that role. To do so requires that the community paramedics possess the appropriate knowledge, skills, and attitudes, which are not inherently part of traditional EMS education. This study sought to evaluate an expert-panel developed training program for community paramedics serving as CTI coaches who support the ED-to-home transition. Methods: This study is a component of an ongoing two-center randomized controlled trial evaluating a community paramedic-implemented CTI to enhance the ED transitions. Community paramedic training covered multiple domains including the CTI program, geriatrics, motivational interviewing, ED discharge, and community health. From after starting the study, we conducted audio-recorded semi-structured interviews with community paramedics in both cities (June–July 2017). After transcribing the interviews verbatim, two members independently performed preliminary coding. Ensuing group data analysis sessions led to the development of final codes and thematic generalizations recurrent in the interviews. Results: All eight participating community paramedics were interviewed. Of the paramedics, five were female and all were non-Hispanic whites. The mean age was 43. Participants described extensive backgrounds in healthcare, primarily as EMS providers, but minimal experience with community paramedicine. All reported some prior training in motivational interviewing, but none from the interviews: (1) certain characteristics make coaches more likely succeed in this program; (2) active rather than passive learning may achieve the best results for community paramedic CTI training; (3) training program components require minor refinements; and (4) continuing education should more effectively address the paramedic coaches’ evolving needs. Conclusions: Paramedics represent a crucial and largely untapped resource for supporting ED-to-home care transitions, such as through the coaching role. Training that leverages the paramedics’ knowledge, skills, and attitudes is critical for effective implementation, including choosing the optimal candidate coaches, delivering training in the most effective manner for different practitioners, and delivering content targeted to student needs.


Matthew Szatokczy, Aaron Klassen, Morgan Marshall, Mengtao Dia, N Clay Mount, Mayo Clinic Department of Emergency Medicine Category of Submission: Trauma

Background: According to Federal Bureau of Investigation statistics, the number of active shooter incidents has increased over the past decade. The purpose of the current study was to describe the EMS response and interventions to mass shooting and active shooter incidents. Methods: Retrospective analysis of 2014 and 2015 National Emergency Medical Services Information System datasets. Date, time, and location for mass shooting and active shooter incidents were obtained from the open source Gun Violence Archive and then correlated with NEMSIS data. Active shooter incidents were identified through FBI data. A de-identified database was generated for final analysis. Results: A total of 608 mass shooting were identified, of which 19 were classified as active shooter incidents. Mean number of injured victims was 4.6 ± 2.5, while mean number of fatalities was 1.2 ± 2.2. NEMSIS data identified 652 EMS activations to 226 unique incidents; 5 were active shooter incidents. 76% of victims were male. 80% of victims were African American. The mean age was 27.7 ± 11.1 years. Dispatch complaint was reported as not known or unknown problem/man down in 14.6% of records. The predominant response configuration was ALS (78.8%), Volunteer services responded to 7% of events. The most commonly reported incident locations were Street/Highway (38.2%), Home/Residence (32.4%), and Trade/Service (11.5%). Location of wound severity was found in 38% (chest), 9%, and head (9%). Tourniquet use was documented in 6% victims. Gunshot wound was self-inflicted in 3% victims. When present, cardiac arrest occurred after EMS arrival in 37.5% of cases. 35.9% of victims were transported to the closest facility. Conclusions: Mass shooting and active shooter incidents are prevalent in the United States, with an average of 5.8 victims per incident.
Despite the fact that extremity wounds were the most common injury noted, suggesting a role for non-bleeding out patient documented EMS tourniquet use was uncommon. While mass shooting events pose high risk for responders, dispatch information was lacking in 6% of records. Reaching flooding EMS agencies were diverse and included BLS providers and volunteers, emphasizing the need to ensure all EMS providers are prepared to respond to mass shootings.

106. WHEN DOGS FLY: USE OF AIR MEDICAL SERVICES TO TRANSFER OPERATIONAL K9S INJURED IN THE LINE OF DUTY

Chelsea Hogan, Chadd Nesbit, Department of Emergency Medicine, Penn State Milton S. Hershey Medical Center Category of Submission: Student, Resident, Fellow

Background: Instances of operational K9 air medical transports have been documented in the popular press. There have been no studies to look at the prevalence of such transports or to determine what policies flight programs have in place to address this challenging situation. We sought to assess the prevalence of operational K9 transports as well as existence and content of protocols to conduct such a transport should one be deemed necessary.

Methods: We distributed a survey to air medical programs in the United States via the Research Electronic Data Capture (REDCap) program. Programs were identified using the Atlas and Database of Air Medical Services (ADAMS). Programs that could not be reached via email were excluded. A survey containing up to 23 questions inquiring about K9 transports, policies and procedures was emailed to 295 identified programs. Results: We received 147 total survey responses (49.8% response).

Results: Twenty-two programs (15%) reported receiving a request to transport a K9 and of those, 15 reported flying the K9. Forty-one K9 transports were reported. Smaller numbers of programs reported having any additional training related to care or transport of operational K9s or a pre-designated emergency veterinarian. Six programs reported carrying some type of equipment for use on K9s and 7 programs reported having some type of protocol in place for these types of flights. Ninety-five of the programs reported that they would be able to fly the K9 and handler as well as the normal flight crew. Conclusions: The goal of this survey was to quantify the number of transports and identify any policies or procedures that programs have in place to carry out a transport if one is requested. Although supposedly a rare occurrence, 15% of our respondents have reported such a request. Of those requests the majority of transports were completed. While some programs may decide that they will not transport an injured operational K9, those programs that will should establish policies and procedures for this type of mission.

107. COMMUNITY PARAMEDIC PARTNERSHIP: SHIFTING HEALTHCARE UTILIZATION THROUGH PARTNERSHIP BETWEEN MUNICIPAL FIRE/EMS AND THE LOCAL LEVEL I TRAUMA CENTER

Tia Radant, Joseph Pasquarella, Ann Majerus, Matthew Simpson, Paula Miller, Sandi Wewerka, Aaron Burnett, Regions Hospital EMS Category of Submission: Community, Quality, Safety Systems, Disaster, Disaster

Background: A partnership between a Level I Trauma Center and an urban, municipal Fire/EMS Department for patients with congestive heart failure (CHF) was launched in 2012. EMS providers were trained to improve healthcare utilization and reduce readmissions through a unique Community Paramedic (CP) partnership. Hypothesis: Patients with congestive heart failure (CHF) for 30 days post-discharge have a reduced rate of readmission and an increased use of clinic visits. Methods: Inpatients with CHF who were offered visits by a CP followed CHF protocol. Inclusion criteria included, local resident, no home care services upon discharge, diagnosis of CHF, English speaking and consent to home visits by a CP. The CP visited the patient in the home 1–2 times per week for 4 weeks following discharge. At each visit the CP conducted medication reconciliation, a physical exam, home safety evaluation, and follow-up contact. New referrals to home care and referral to community or healthcare resources as needed. Pre/post comparisons were analyzed descriptively using means and standard deviations. Scores were assessed with Wilcoxon signed-rank tests. Results: A total of 64 patients were enrolled between February 2015 and July 2017; 52 patients completed the program with complete data. A comparison of 90-day healthcare utilization pre- and post-admission showed that patients who were provided CP services had a significant decrease in hospital admissions (p = 0.0001) and ED visits (62%, p < 0.0001), and had a 14% increase in clinic visits (ns, p = 0.45). A group of psychiatrists that met inclusion criteria but declined consent to participate was compared to the group of patients that participated in the CP program. Patients who completed the program had a significantly higher decrease in admissions (p = 0.0145) and ED visits (p = 0.0002) before post-hospitalization than those who did not enroll (n = 20). There was no significant difference in change in clinic utilization. Conclusions: Partnership between pre-hospital CP and hospitals for Community Paramedic programs can be successful. CP’s providing post-discharge care of healthcare utilization toward reduced admissions/ED visits and increased clinic visits. Further research with a larger cohort is needed to determine if utilization patterns would be sustained past 90 days.

108. "PD_TREE": DEVELOPMENT OF A NEW PEDIATRIC PREHOSPITAL TRANSPORT DESTINATION EBG

Jennifer Fishe, Kye Fratta, Jennifer Anderson, University of Florida COM - Jacksonville, Department of Emergency Medicine Category of Submission: Pediatric

Background: Prehospital triage should match patient needs with hospital service availability. EBGs guide EMS destination choice for adult patients suffering from trauma, MI, and stroke. However, analogous guidelines do not exist for any pediatric condition save trauma. This study’s objective was to create a non-trauma pediatric prehospital transport destination algorithm, matching 14 non-trauma conditions/risk factors (including ALTE, seizure requiring EMS-administered benzodiazepine, sepsis, and emergencies related to conditions treated at a medical home) to three different levels of pediatric care (specialty, comprehensive, regional). Conclusions: Existing medical literature identifies the need for prehospital transport destination guidance for non-trauma pediatric patients. That evidence supports the modified-Delphi process that produced the “PD_tree”, a new non-trauma pediatric prehospital destination EBG. "PD_tree" will be pilot tested by computerized resource modeling, prehospital simulation, and implementation in three diverse EMS agencies.

109. DUPLICATE PROCEDURES AND CHARGES ASSOCIATED WITH PEDIATRIC INTER-FACILITY TRANSFER FROM EMERGENCY DEPARTMENTS

Ali Aledhaim, Jon Mark Hirshon, Jennifer Fishe, Jennifer Anderson, University of Maryland Department of Emergency Medicine Category of Submission: Pediatric

Background: Interfacility Transfer (IFT) of patients with emergency conditions from an Emergency Department (ED) delays definitive care and burdens the patient with potentially harmful duplicate procedures and extra charges. This physical and economic hardship may be preventable if patients are taken to a definitive care facility for their initial destination. Objective: To determine duplicate procedures and charges among pediatric patients undergoing IFT for patient admission after an ED visit to a different facility. Methods: This study utilized three years (2010–2012) of Maryland HCUP ED and inpatient visit data. A modified probabilistic linkage was performed to identify ED patients who were dispositioned to IFT and admitted to a distant facility. Included patients were 0–17 years of age with any of the 20 most common Diagnosis Categories (DxC) and whose conditions were classified “emergent” or “urgent”. After linkage, duplicate procedures were identified and classified as administrative or clinical. Multiple regression analysis was used to compare the average total charges of IFT patients, including duplicate charges, to non-IFT admitted patients presenting with the same top 20 DxC. Results: Of the 9,447 IFT inpatients identified 2,254 patients were successfully linked, of which 1713 (76%) had one of the top 20 DxC. The most frequent administrative duplicate procedure was ER EMTALA emergency medical screening (1,407). Notable duplicate clinical procedures included chest X-ray (239) and CT scan of head (97) or body (32). IFT patients incurred an average (SD) of $1,754 (1,765) in charges, including average duplicate charge of $1,627.84. In comparison, the average charge incurred by a non-IFT was $8,209.72. Adjusting for the effect of age, gender, and race, a weighted regression model produced the “PDTree,” a new non-trauma pediatric prehospital destination EBG. "PDTree" will be pilot tested by computerized resource modeling, prehospital simulation, and implementation in three diverse EMS agencies.
compared to a non-IFT patient. Conclusions: Both safety harms (radiation exposure) and significant economic savings have been identified in IFT. However, it has been shown that IFT patients undergoing IFT from an ED for inpa-
tient admission to a distant facility. EMS sys-
tems can minimize this inefficiency and burden by providing training and preparing to definitive care facili-
ties whenever feasible.

110. CLINICAL EVENTS IN PREHOSPITAL PATIENTS WITH ST- ELEVATION MYOCARDIAL INFARCTION TRANSPORTED TO A PCI CENTER BY BASIC LIFE SUPPORT PARAMEDICS IN A RURAL REGION

Pierre-Alexandre LeBlanc, Sylvain Bussières, François Bégin, Alain Tangtay, Jean-Michel Paradis, Denise Hébert, Richard Fleet, Départe-
ment de Médecine d’Urgence – Université Laval CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Rural areas have limited hospi-
tal staff and often rely on basic life support (BLS) paramedics for inter-facility transport. No previous study has established whether ST-segment elevation myocardial infarction (STEMI) patients diverted and transported to the near-
est PCI-capable center according to an emerg-
ency physician’s interpretation of a 12-lead ECG transmission parameters. Patients had con-
scious electrocardiogram (ECG) and vital signs monitoring during transport. A focus group com-
posed of established clinically important and minor events based on liter-
ature search. A multivariate ordinal logistic regression model was used to study the asso-
ciation between transportation time (0–14, 15–
29 and >30 min) and the occurrence of clin-
ical events. Results: Clinically important and minor events were experienced by 18.6 and 12.6% of BLS paramedics, respectively. Transport-
time was not associated with higher risk of suffering from clinical events (p = 0.182). The most frequent events were brady-
cardia (47%), hypotension (25%) and ventricular tachycardia / ventricular fib-
ration (VT/VF) (5.13%). All patients suffer-
ing from VT/VF were successfully resuscitated with defibrillation. No death on arrival at PCI center was recorded. Conclusions: Prehospi-
tal STEMI diagnosis by transmission of a 12-
deep ECG interpreted by emergency physicians and triage for primary PCI by paramedics with-
out advanced care training is a safe option that could use less advanced staff in rural areas with limited resources.

111. DESCRIPTION OF DRUG-ASSISTED INTUBATION IN STATEWIDE TREATMENT PROTOCOLS

Steven Sommerville, Daniel Wilner, David Schoenfeld, Beth Israel Deaconess Medical Center CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Endotracheal intubation in pre-
hospital airway management has been a focus of research and debate for decades. Endo-
tracheal intubation is performed using drug-
assisted intubation (DAI) or without medica-
tion. DAI is divided into rapid sequence intu-
bation (RSI) where a sedative as well as neu-
oparalytic is used or sedative only intubation. The extent to which DAI is incor-
porated in statewide treatment protocols (STP) has not been described. The majority of states have STPs that are either mandatory or serve as a guide for medical directors. The purpose of this investigation was to describe the extent to which STPs include DAI and the variabili-
ty in pharmacopeia utilized. Methods: Cross-
sectional study of STP utilizing a standardized review of STP. STPs included 117. Results: Pro-
tocol revision date was also captured. Results: Thirty one out of fifty states (64%) issue STPs, seven (22%) of which serve as guidelines. RSI is included in the STP of 16 states. Sedative-
only intubation is included in the STP of 5 states (16%). The most commonly included induc-
tion agents are etomidate and midazolam (19 STPs each, 61%); other induction agents include ketamine (11 STPs, 35%), fentanyl (2 STPs), and propofol (1 STP). Succinylcholine is the most commonly included paralytic (17 STPs, 55%); rocuronium (11 STPs, 35%) and vecuro-
nium (7 STPs, 23%) are other approved para-
lYTic agents. 16 states (52%) permit intubation of both adult and pediatric patients while 6 states (19%) only allow DAI of adult patients. All pro-
tocols have been revised within the past 5 years and 75% of protocols were revised since 2015. Conclusions: The NAEMSP position statement on prehospital drug-assisted intubation (DAI) extends the use of a paralytic during DAI, as it increases the likelihood of first pass success. Just over half of all STPs allow for DAI, and 16% allow for sedative-only intubation. The NAEMSP position statement on DAI. There is significant variation in both the induction agent as well as the paralytic utilized for intubation across STPs. There is also variation in the number of states that allow for both adult and pediatric intu-
bation. Additional research is needed to deter-
mine optimal agents and protocols for prehos-
ital intubation.

112. ASSESSMENT OF INTRAOSSEOUS NEEDLE PLACEMENT BY EMS PROVIDERS

Alexandra Petrie, Jeffrey Lubin, Penn State Col-
lege of Medicine CATEGORY OF SUBMISSION: OPER-
ATIONS, QUALITY, SAFETY SYSTEMS, DISASTER, DISASTER

Background: Intraosseous (IO) needle place-
cement can be used to provide quick delivery of various medications. Particularly, in cases in which venous access is compro-
mised; however, if done incorrectly, it can lead to unwanted complications such as extravas-
a on of fluid, peripheral arterial thrombosis, and per-
foration (Paxton 2009; Dev 2014; Gluckman 2014). The purpose of this study is to see if EMS providers can adequately locate the correct locations for the placement of IO needle in live models. Methods: We assessed the accu-
rac y of intraosseous placement by asking EMS providers from a statewide conference to sim-
ulate where they would use an intraosseous needle on standardized patients. Each partici-
patant also filled out a demographic survey that included their experience with intraosseous needles and a knowledge of acceptable EZIO intraosseous needle landmarks from a list of options. Measurements were established on live human models using transfer paper with stickers placed in IO spots. Marked on each IO spots, marked so that they easily lined up with the model via landmarks. The participant was asked to place a sticker directly on the model where they would insert the EZIO at both locations. Afterward, a transfer sheet with the sticker placed at a location correlating with standard placement was compared against the participant-placed sticker. Differences in placement were measured with a ruler to the near-
est half centimeter. Direction was qualitatively noted. Numbers were assigned to each partic-
ipation so that the time taken to interpret survey, loca-
tion survey, and sticker location could be linked to each individual subject (N = 30). Results: Results were analyzed via several 2 sample t tests using 0 as the standard landmark. The average distance from the landmark on the humerus was 5.06 cm (95% CI: 4.80–5.32). The average from the tibia was 4.13 cm (95% CI: 3.86–4.40). Both were statistically signifi-
cant with a p value of <0.0001. Conclusions: These results show a low accuracy among EMS providers in identifying correct landmarks for intraosseous needle placement. This suggests additional training and skills review may be needed across the state in order to safely per-
form this procedure.

113. PARAMEDIC RECOGNITION AND MANAGEMENT OF ANAPHYLAXIS IN THE PREHOSPITAL SETTING


Background: Anaphylaxis is a life-threatening condition that paramedics are equipped to treat effectively in the field. Current literature sug-
gests improvements in paramedic recognition and management of anaphylaxis. The aim of this study was to compare the proportion of cases of anaphylaxis appropri-
ately treated with epinephrine by paramedics before and after a targeted education and training program. Methods: This was a retrospective medical records review of patients with ana-
phylaxis managed by primary or advanced care paramedics in five Emergency Medical Ser-
vice areas in Ontario, before and after an edu-
cational module was introduced. This mod-
ule included education on anaphylaxis diagno-
sis, recognition, treatment priorities, and feedback on the recognition and management from the before period. All paramedic call records (PCRs) coded as “local allergic reaction” or “anaphylaxis” during 12-month periods before and after the intervention were reviewed by trained data abstractors to determine if patients met an international definition of anaphylaxis. The details of interventions performed by the paramedics were used to determine primary and secondary outcomes. Results: Of the 600 PCRs reviewed, 99/120 PCRs in the before and 303/380 in the after period were identified. Of the charts included, 63/99 (63.6%) in the before and 136/300 (45.3%) in the after period met cri-
teria for anaphylaxis (p = 0.002). Of the cases meeting anaphylaxis criteria, 41/63 (65.1%) in the before period and 88/136 (64.7%) in the after period were correctly identified as anaphylaxis (p = 0.96). Epinephrine was administered in 57/63 (87.9%) of anaphylaxis cases in the before period and 76/136 (55.9%) in the after period (p = 0.70). Anaphylactic patients with only two-system involvement received epinephrine in 20/40 (50.0%) cases in the before period and 45/93 (48.4%) in the after period (p = 0.86). Conclusions: There are gaps in paramedic recognition and management of anaphylaxis, particularly in cases of two-system involve-
ment. These gaps persisted after the imple-
mentation of an educational intervention. Other quality interventions and periodic reviews may be necessary to improve prehospital treat-
ment of anaphylaxis. Limitations include an increase in overall cases and decrease in rate of true anaphylaxis in the after period, which may relate better cases to lower PCR or to other electronic PCR implementation and changes in paramedic recognition.

114. NATIONAL DESCRIPTION OF PATIENT REFUSALS FOLLOWING PREHOSPITAL ADMINISTRATION OF NALOXONE

Mirinda Gormley, Juan Lu, Virginia Common-wellth University CATEGORY OF SUBMISSION: MEDICAL
Background: Emergency medical services (EMS) personnel deliver Naloxone to reverse depressions. However, EMS personnel may experience challenges with patient care, including being unable to convince a patient to be transported to the hospital. We describe following appropriate follow-up, these patients could overdose again. Objective: Identify characteristics associated with patients who received Naloxone from EMS but refused transportation to hospital. Methods: Data came from the 2015 National Emergency Medical Services Information System. The incident/patient disposition was used to create 4 groups: “treated, transported,” “treated, transported by EMS,” “treated, transported by Law Enforcement” made up “transported,” and no treatment required, “patient refused care,” “treated and released,” and “treated, transported by private vehicle” comprised “refused.” Characteristics included age, gender, race, prior aid, location, U.S. census region, and urbanicity. Descriptive and multivariable logistic regression were utilized. Results: In 2015, EMS agencies reported 585,108 encounters by personnel per transport unit during a 9-1-1 response. After treatment, 1.6% of patients refused transport. These patients were primarily male (65.0%), white (75.7%), urban (79.9%), and had a median age of 48.8% (OR = 0.58-1.84). Larger percentages of patients went to the hospital if found in a public location (19.7% vs. 13.5%), or a rural/wilderness area (10.4% vs. 6.6%; OR = 1.05-1.35). Patients had nearly double the odds of being transported from a public location rather than a residence (OR = 1.70, 95% CI = 1.58–1.84), and double the odds of being transported from a wilderness location compared to a residence (OR = 1.58, 95% CI = 1.44–1.73). Patients who did not receive aid prior to EMS arrival were nearly twice as likely to go to the hospital (OR = 1.71, 95% CI = 1.61–1.81). Conclusions: While effective at reversing fatal overdoses, prehospital administration of Naloxone is not the solution to address the opioid epidemic, as those transported to hospital could still access treatment. EMS agencies should work together with public safety partners to plan how to work with patients most at risk of refusing transport following initial treatment.

115. EMS COMPASS BENCHMARKS USING A NATIONAL EMS DATASET: STATUS EPILEPTICUS AND HYPOGLYCEMIA PERFORMANCE MEASURES

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nudell, Williamson County EMS CATEGORY OF SUBMISSION: MEDICAL

Background: Status epilepticus and hypoglycemia are emergent conditions, both of which can be effectively treated by EMS. It is unclear how these assessments and treatments are given. EMS Compass is a national organization that has developed several clinical measures. No work has been done to benchmark performance against large national datasets. This is necessary for quality improvement efforts and refinement of the measures themselves. We aim to describe compliance with key measures using a large, national cohort. Methods: Using a 6% sample of 9-1-1 consenting EMS agencies using the ESO electronic health record (EHR), we calculated the measures among transported 1–1 patients for the following measures: (1) some type of glucose given to those with blood glucose under 60, (2) a blood glucose documented for those felt to be in status epilepticus, and (3) a benzodiazepine given for those in felt to be in status epilepticus. For measures requiring administration of a medication, only ALS providers were included in the measure, and a 95% confidence interval were calculated. Results: A total of 147,238 patients had a documented blood glucose <60. Of these, 117,358 (80.5%) met all inclusion criteria and received some type of glucose. Of 11,148 patients with a status epilepticus, 8,072 (72.4%, 71.6-73.2%) had a blood glucose documented and 6,250 (56.1%, 55.1-56.0%) had some type of benzodiazepine use for status epilepticus. It is possible that this is a function of poor, non-standard documentation, imprecise measure definitions, or poor clinical performance. In any case, these results identify opportunities for important system improvement.

116. ANALYSIS OF MEDICATION STORAGE TEMPERATURES IN A MODERN EMS FLEET: PRELIMINARY RESULTS FROM THE ANALYSIS OF MEDICATION STORAGE TEMPERATURES TRIAL (AFFIRE)

Timothy Burns, Alan Butsch, Christopher Touzeau, Roger Stone, Barry Reid, Montgomery County (MD) Fire And Rescue Service CATEGORY OF SUBMISSION: PROFESSIONAL

Background: EMS operational programs deploy medications using a variety of means under all kinds of conditions. Because of this deployment versatility, medications that were once limited to somewhat controlled clinical settings are now deployed on vehicles whose climate control is not always ideal. Purpose: To explore whether or not EMS medications deployed in modern fire and EMS vehicles experience temperatures that are outside storage temperature ranges from the US Pharmacopeia. Hypothesis: Medications will be exposed to temperatures outside the guidelines in all types of our apparatus. Methods: We recorded ambient temperatures on two of our paramedic engines and in two of our transport units during two summer months in 2017 using temperature data loggers. Once downloaded into a database, continuous temperature data created a continuous stream of temperature data for the entire study period. Results: Data from the paramedic engine location reveals that the transport unit was subjected to “extreme heat” exposure. During the summer period, in the range “warm” (86–104 °F) for 5759 minutes (6%), “hot” (105–113 °F) for 3795 minutes (4%), and “extreme heat” (114–123 °F) for 1209 minutes (1%). The engine location endured “extreme heat” exposure with a range of “controlled room temperature” ranging from 89229 minutes (94%). Neither position in the engine did not experience temperatures that are outside storage temperature ranges from the US Pharmacopeia. Conclusion: Medications will be exposed to temperatures outside the guidelines in all types of our apparatus. For survival to discharge in iatrogenic agents were statistically insignificant (AORs 3.61, 95% CIs 0.86 to 15.06). Conclusions: There was significant temporal variability in the incidence of anaphylaxis-associated OHCA during the study period. There is significant temporal variability in the incidence of anaphylaxis-associated OHCA, with its peak during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the study period. There is significant temporal variability in the incidence of anaphylaxis-associated OHCA, with its peak during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCA during the summer months. A total of 224 anaphylaxis-associated OHCA were included in the analysis. Factors contributing to anaphylaxis include insect sting and foods were 192 (85.6%) and iatrogenic agents group were 32 (14.3%).
associated with an adjusted odds ratio of 13.8 (Confidence interval 4.8–39.9) for failure with a standard 25g catheter needle decompensation. 

**Conclusions:** In the increasingly obese general population, needle thoracostomy with a standard 25g needle may be more prone to failure. Multivariate analysis indicated that the machine was a significant factor for anticipated failure of needle tube decompression. Alternative anatomic sites for needle decompensation did not appear to increase the anticipated success of the intervention.

119. **Evaluating the Incorporation of a Journal Club Series into Paramedic Initial Education**

Lauren Maloney, Paul Werfel, Robert Marshall, Scott Johnson, Stony Brook University Dept of Emergency Medicine Category of Submission: STUDENT, RESIDENT, FELLOW

**Background:** Given Paramedic National Standard Curriculum cognitive objectives, we developed an 8-hour curriculum that guides educators and paramedic students (PS) through the scientific process and offers a simple way to find and evaluate research articles. We then evaluated its impact on PS perception of finding and evaluating research articles, and their interest in participating in future prehospital research studies. **Methods:** PS participated in four 2-hour long journal club sessions. First, the educators introduced four types of articles and highlighted differences between formats. Next, PS used search engines to fact check references of a free open access article. Third, PS sent articles on a topic selected by the class to the educator, who facilitated a discussion of several articles after a short statistics lecture. Finally, PS found an article on a topic of their interest after a short statistics lecture. **Results:** A total of 21 PS participated. 81% were male, with an average age of 24. 43% were college graduates. Before the module, 76% of PS could identify a research article, 29% had a journal subscription, and many read articles several times a month (38%) or year (32%). By questionnaire, the five-point Likert scale responses that were converted to numeric responses (strongly disagree = 1, strongly agree = 5) and analyzed using a paired t-test for significance. After the module, PS had significantly more agreement that they could find research articles (p < .001) and are interested in attending a journal club for their continuing education (p = .01). PS significantly disagreed more that patient care decisions should be based on personal experience instead of research based evidence (p = .01). All PS agreed the module was a productive use and would recommend it to others. **Conclusions:** This cohort reported increased knowledge and skills gained during the module. The module may improve understanding of research articles and had overall positive trends in opinions about evidence-based medicine.

120. **Double-Sequential Defibrillation: Efficacy and Risk of Defibrillator Damage Are Higher For the Choice of Shock Timing and Shock Vectors**

Tyson Taylor, Sharon Melnick, Fred Chapman, Gregory Wautical, Physio-Control, Inc. Category of Submission: CARDIAC

**Background:** Double-sequential defibrillation (DSD) is the use of two defibrillators for delivery of two near-simultaneous shocks in an attempt to terminate refractory VF. We hypothesized that the efficacy of DSD compared to control shocks (one vector, one device, shock size the same, separated by 10 ms DSD shocks) would depend on the time between the two shocks. Furthermore, we hypothesized that the potential for damaging a defibrillator during DSD would depend on the defibrillator vectors. **Methods:** To assess shock efficacy, defibrillation pads were applied in lateral-lateral (LL) and anterior-posterior positions in 10 anesthetized pigs. Episodes of electrically-induced VF were treated with a shock of a block-randomized therapy. Shock energy was chosen to yield approximately 25% success for a single LL shock. We compared LL stacked shocks (i.e., a failed LL shock was repeated) and seven DSD shock intervals (Overlapping; 10, 50, 100, 200, 500, 1000 ms apart), with n = 81 VF episodes per therapy. To assess the potential for damaging a defibrillator, two sets of pads were applied in six different configurations (either approximately parallel or approximately orthogonal defibrillation vectors). Ten 360 J shocks were delivered from one set of pads while the voltage across the second set of pads was measured. We compared the voltage coupling ratio (VCR): ratio of the measured voltage to the delivered voltage. **Results:** Compared to stacked LL shocks, DSD shocks that were Overlapping, 10, and 100 ms apart significantly increased efficacy (p < .05). DSD shocks 50 ms apart significantly decreased efficacy (p < .05), and DSD shocks 200, 500, and 1000 ms apart were not different. During DSD potential damage assessment (DSD potential damage assessment: VCR < 0.65), 1000 shocks were delivered and voltage across the second set of pads ranged from 1.2 to 503 V; parallel vectors resulted in significantly higher VCR compared to orthogonal vectors (15.2 ± 0.6% vs. 1.6±0.12%, p < 0.0001). **Conclusions:** The efficacy of orthogonal-vector DSD is highly dependent on time between shocks and can increase, decrease, or not change compared to stacked shocks on a single vector. Potential for defibrillator damage during DSD can likely be minimized by choosing near-orthogonal defibrillation vectors.

121. **Biometric Analysis of Thoracolumbar Movement During Ambulance Transport**

David Wampler, Ronald Stewart, Rena Summers, Lawrence Roakes, Mike Shown, Craig Cooley, Chetotechny, Brian Eastridge, The University of Texas Health Science Center at San Antonio Category of Submission: TRAUMA

**Background:** Within the community of trauma surgeons, emergency medicine physicians and emergency medical services (EMS) providers responsible for the care of injured patients, there is mounting concern that the long spine board (LSB) does little to reduce spinal motion, and that risk outweighs benefit. The purpose of this study was to evaluate the movement of the thoracolumbar spine during ambulance transport, comparing different patient positions with and without LSB. We hypothesized that transport on a mattress with the head of the bed elevated would limit thoracolumbar movement more effectively than a LSB. **Methods:** This was a randomized 10-treatment adult healthy volunteer crossover trial. Real-time 3D motion analysis of the thoracolumbar region was measured using a wireless motion tracking system. Positions analyzed included zero and 10, and 20 degree incline, and on EMS stretcher with head elevated to 10, 30, 45, and 60 degrees. Nine healthy adults (5 female, 4 male). Comparing movement between LSB and no LSB respectively, there was no significant difference in three-dimensional volumetric movement of the thoracic spine (2 ± 0.6 mm LSB and 1.5 ± 1.0 mm no LSB), and that the positions that allowed the lowest mean volume of spinal movement were: head of the bed elevated to 10 degrees and 30 degrees with headblocks adhered to the spine with 1.5 and 0.9 ± 0.5 mm respectively. **Conclusions:** In healthy volunteers thoracolumbar spin motion was limited in all groups and not contingent upon use of LSB. These data support the assertion that the long spine board is not superior for immobilization, and that more investigation should be performed to evaluate optimal thoracolumbar immobilization.

122. **Supraglottic Airway Utilization vs Endotracheal Intubation Pre/Post Ground and Air-Based EMS Service**

John Lyng, Michael Perlmutter, Alex Trembley II, Marc Conterato, Michaela West, North Memorial Health Ambulance and Air Care Category of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS, DISASTER

**Background:** Identify changes in invasive airway management using supraglottic airways (SGA) as the primary and secondary interventions following transition from the King LTS-D to the i-gel LMA in an EMS setting. **Methods:** This is a retrospective observational study performed in a US-based ground/air EMS performing 86,000 transports annually. Charts documenting an attempt at invasive airway placement over a 12 month period were abstracted for age, gender, airway indication, type(s) of invasive device attempted, number of placement attempts, and placement success. Two cohorts were defined: cohort “K” represent- ing King LTD and cohort “I” representing i-gel LMA. ETI was continuously available. Primary endpoint was number of successful and fully managed using a SGA. Secondary endpoints included rate of use of invasive devices based on clinical indication and use of devices as primary or secondary intervention. **Conclusions:** Age and gender were not significant. ETI utilization increased from 50,000 transports annually. Charts documenting an attempt at invasive airway placement over a 12 month period were abstracted for age, gender, airway indication, type(s) of invasive device attempted, number of placement attempts, and placement success. Two cohorts were defined: cohort “K” representing King LTD and cohort “I” representing i-gel LMA. ETI was continuously available. Primary endpoint was number of successful and fully managed using a SGA. Secondary endpoints included rate of use of invasive devices based on clinical indication and use of devices as primary or secondary intervention. **Conclusions:** Age and gender were not significant. ETI utilization increased from 50,000 transports annually.
123. I Love My Community Paramedic: Patients Report Overwhelming Satisfaction with Community Paramedic Program

Tia Radant, Paula Miller, Joseph Pasquarella, Ann Majerus, Jennifer Murphree, Stephen Bloomstrand, Aaron Burnett, Regions Hospital EMS CATEGORY OF SUBMISSION: Operations, Quality, Safety Systems, Disaster

Background: Patient satisfaction is a key indicator of healthcare quality. Community Paramedic Programs (CP) are an emerging profession and as such is there is limited data on patient satisfaction with CP programs. Hypothesis: Patients enrolled in a 30-day post-discharge community paramedic program report high satisfaction with both the program and the care provided by the CP. Methods: Inpatients with a diagnosis of CHF were offered post-discharge home visits by a CP for up to 30 days after discharge. Inclusion criteria required that the patient was a local resident, not eligible for home-health services upon discharge, diagnosis of CHF, English speaking, and written, informed consent to home visits by a CP. The CP conducted home visits in the patient’s home 1–2 times per week depending on the patient’s needs. At the final visit the patient was surveyed to assess their satisfaction with the program. Scores ranged 1–4, 1 being “very dissatisfied” and 4 being “very satisfied.” Mean scores from the Likert scale were analyzed and are reported descriptively. Results: A total of 59 patients completed surveys regarding their satisfaction with the CP program. Mean scores for each question were as follows: willingness to listen carefully to the patient (4.0), time taken to answer patient questions (4.0), amount of time spent with the patient (4.0), explaining things in a way the patient could understand (3.95), instructions regarding medication and follow-up care (3.97), thoroughness of the examination (4.0), advice given on ways to stay healthy (3.94), and overall satisfaction level (4.0). 100% of patients responded they would recommend the community paramedic service to others. Conclusions: Patients provided overwhelmingly positive feedback on the CP program. Patient’s open responses included: “I was glad they were here the first day that I got out of the hospital.” When I got out of the hospital I was so messed up, I had all these drugs and stuff, and she went through them and got everything worked out. It made them and got everything worked out. It made it so much easier for me. It made her go through things and stuff. And she went through things and stuff.” This study is limited by the small sample size. We hope to maintain these results as the program continues.

124. Evaluation of Educational Methods for Prehospital Medical Command (PMC) Training for Emergency Medicine Residents (EMRs)

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Background: PMC is a crucial part of EMR training. This skill can be difficult to teach in predominantly off-line prehospital systems, and training for PMC may not be standardized across programs. The purpose of this study was to evaluate the comprehensiveness of PMC curriculum for EMRs. Methods: Setting: Tertiary academic medical center. Participants: EMRs. Design: Subjects were taught PMC in phases consisting of (1) review of PMC concepts, (2) review of PMC concepts, and (3) simulated PMC calls. A survey was given pre-training and after each phase using a Likert Scale to assess comfort with medical command (MC), refusal of medical assistance (RMA), and field termination (FT) along with familiarity of protocols (FP) and phase usefulness (PU). Mean Likert scores for these categories were compared among phases using the t-test and Mann-Whitney test, respectively, with statistical significance set a priori at < 0.05. Results: The most useful and instructional phase. Pre- and post-tests were given to evaluate changes in knowledge. Mean and median test scores were similarly compared. The IRB deemed this study exempt. Conclusions: Statistically significant differences were found in all comparisons, except for FT, FP, and PU from phase 1 to 2 and from phase 2 to 3, and for MC, and RMA from phase 1 to 3. For the former group, statistically significant differences were found from phase 1 to 3. A statistically significant increase was found in test scores (mean 50% to 65%, median 40% to 67%). Participants found phase 2 the most useful and simulated calls the best way to learn PMC. Conclusions: A statistically significant increase in Likert scores was found in all categories from pre-training to completion of all phases. The study found a possible cumulative effect of phases 2 and 3 for FT and FP, suggesting a learning of simulated calls to review of PMC calls alone. The statistically significant increase in test scores demonstrated an increase in PMC knowledge from the training. One of the goals of the program was to identify a consistent population due to EMR schedules. Further research should provide the training over one day to ensure consistency.

125. Effect of Transport Time Interval on Neurological Recovery after Out-of-Hospital Cardiac Arrest in Patients without Prehospital Return of Spontaneous Circulation

Jeong Ho Park, Yu Jin Kim, Young Sun Ro, Sola Kim, Sang Do Shin, Kyung Jun Song, So Yeon Kong, Ki Jeong Hong, Sun Young Lee, Department of Emergency Medicine, Seoul National University Hospital CATEGORY OF SUBMISSION: Operations, Quality, Safety Systems, Disaster

Background: Longer transport can adversely affect the outcomes of out-of-hospital cardiac arrest (OHCA) patients without return of spontaneous circulation (ROSC), and those effects can be offset at least partially by prehospital stroke (STI) assessment efforts at the scene are insufficient. The aim of this study was to determine the association between the transport time interval (TTI) and neurological outcomes in OHCA patients without ROSC. Methods: We analyzed 57,902 adult OHCA patients with presumed cardiac etiology and without prehospital ROSC. The primary exposure was TTI, which was categorized as short (1–5 min), intermediate (6–10 min), and long (≥11 min). The primary outcome was good neurological recovery at discharge (cerebral performance category of 1 or 2). Multiple logistic regression analysis was used, and the final model included an interaction term between TTI and scene time interval (STI). Results: Among the patients, 40%, 36%, and 24% were classified as short, intermediate, and long TTI, respectively. Good neurological recovery occurred in 1.0%, 0.6%, and 0.3% of the short, intermediate, and long TTI groups, respectively. Referring the short TTI group, the adjusted odds ratios (aORs) [95% confidence interval (CI)] of TTI for good neurological recovery was 0.58 (0.47–0.74), 0.79 (0.65–0.97), and 0.30 (0.21–0.41) for long TTIs. In the interaction model, the aOR of TTI for good neurological recovery was smaller in the 1- to 5-min STI group than in the ≥6-1 min STI group. Conclusions: A longer TTI adversely affected the likelihood of good neurological recovery among OHCA patients without prehospital ROSC. This negative effect was intensified when the STI was short.

126. Community Paramedic Point of Care Blood Analysis: Validity and Usability Testing of Two Commercially Available Devices

Ian Blanchard, Ryan Kozicki, Dana Dalporto, Stacy Goulier, Suzanne Snosky, Karen Leaman, Susan Biesbroek, Lenore Page, Lyle Redman, Keith Spackman, Tyler Williamson, Christopher Doig, Gerald Lazarenko, Alberta Health Services/University of Calgary CATEGORY OF SUBMISSION: Professional

Background: Community Paramedics (CPs) require access to timely blood analysis in the field to guide treatment. Point of care testing (POCT), as opposed to traditional laboratory analysis, may offer a solution, but limited research exists on CP POCT. Purpose: In the CP setting, to assess the validity of two devices (Abbott i-STAT and Alere epic) and contrast their usability. Methods: In a CP program responding to 6,000 annual patient care events, a split sample validation of POCT against traditional laboratory analysis for seven analytes (sodium, potassium, chloride, creatinine, hemoglobin, hematocrit, and glucose) was conducted on a sample of 39 patients requiring blood analysis. The difference of proportion of discrepant results between POCT and laboratory was compared using a two sample proportion test. Usability was analyzed by survey of CP experience, linear mixed effects model of Systems Usability Scale (SUS) adjusted for experience, expert heuristic evaluation of devices, device-logged errors, and coded observations of quality control testing. Results: Of 1,649 study period patient care events, 174 had a blood draw, with 108 events (65.2%) enrolled in the study. Participants had a mean age of 58.7 years (SD16.3); 49% were female. In 4 of 646 (0.6%) individual comparisons, POCT reported a critical value but the laboratory did not; occurring more often in i-STAT (0.9%; 95% CI: 0.0%, 1.9%) compared to epic (0.3%; 95% CI: 0.0%, 0.9%; p = 0.323). There were no instances of the laboratory reporting a critical value when POCT did not. In 88 of 1,046 (8.4%) individual comparisons the a priori defined acceptable difference between POCT and the laboratory was exceeded, occurring more often in i-STAT (8.8%; 95% CI: 8.1%, 13.3%) compared to i-STAT (6.1%; 95% CI: 4.1%, 8.2%; p = 0.007). Eighteen of 19 CP surveys were returned, with 11/18 (61.1%) preferring i-STAT. Participants had a higher mean SUS score compared to the epic (84.0/100 vs. 59.6/100; p < 0.011). Fewer field blood analysis device-logged errors occurred in i-STAT (7.8%; 95% CI: 2.9%, 12.7%) compared to epic (15.5%; 95% CI: 9.3%, 21.7%; p = 0.063). A possible explanation may relate to usability issues with the epic cartridge and test menus. Conclusions: CP programs can expect valid results from POCT in most instances, however an important discrepancy between traditional laboratory did occur. Further assessment suggests a preference for i-STAT.

127. Characteristics of Paramedic Graduates Who Retest after an Unsuccessful Attempt on a National Cognitive Examination

Ashley Larrimore, Rebecca Cash, Remle Crowe, Madison Rivard, William Krebs, Jeremy Miller, Ashish Panchal, Department of Emergency Medicine, Mayo Clinic Rochester, Mayo Clinic Rochester CATEGORY OF SUBMISSION: Operations, Quality, Safety Systems, Disaster

Background: Paramedic program graduates invest significant time and effort in completing their training. However, some graduates are...
unsuccessful on the national paramedic certification examination on their first attempt. The proportion of graduates who do not retest, despite available attempts, is unknown. The objective was to describe paramedic graduates who do not retest and their associated characteristics. We hypothesized that fewer graduates chose not to retest and retesting was not associated with specific candidate characteristics. 

Methods: We conducted a cross-sectional evaluation of national paramedic certification examination results for the class of 2013. This computer adaptive test terminates when the 95% confidence interval surrounding the estimated ability of the candidate’s ability is entirely above or below the passing standard. Test length ranged from a minimum of 80 to a maximum of 150 questions. Unsuccessful testers were defined as candidates who had a grade of fail or incomplete (did not finish the examination) on their first examination attempt. Graduates of military only training programs were excluded. Chi-square tests, Wilcoxon Rank Sum test, and two tailed independent t-test were used to compare demographics and individual performance on the examination between successful and unsuccessful testers. 

In 2013, 11,090 paramedic graduates attempted the national paramedic cognitive examination for the first time with an overall pass rate of 73%. Paramedic graduates who were unsuccessful were 49% more likely to be maximum length testers (38%, N = 1,148) than minimum length testers (29%, N = 892). Most graduates who were unsuccessful chose not to retest (89%, N = 2,697). There was no clinically significant difference in the median age (28 vs. 29 years, p = 0.0156) or race/ethnicity (white, non-Hispanic 88% vs. minority 9%; p = 0.706) of students who chose to retest. Female students (86%, N = 734) were less likely to retest than male students (90%, N = 1,951, p = 0.001). Conclusions: The majority of graduates who were unsuccessful on their first attempt retested on the national paramedic cognitive examination with female graduates having lower retest rates. This study was limited by the lack of graduate specific information concerning their reasons for retesting. Future studies will need to focus on the individual characteristics with which graduate students chose not to retest. 

128. Interaction Effect between Bystander Cardiopulmonary Resuscitation and Community Urbanization Level on Outcomes after Out-of-Hospital Cardiac Arrest

Jeong Ho Park, Young Sun Ro, Sang Do Shin, Kyung Jun Song, Ki Jeong Hong, Soo Jeong Ho Park, Young Sun Ro, Sang Do Arrest

The effect of Bystander CPR and DA-CPR was more prominent in rural areas than urban areas.

129. A National Description of the Use of Continuous Positive Airway Pressure in the Prehospital Setting

Rebecca Cash, Remle Crowe, Jeremiah Kinsman, Madison Rivard, Dave Bryson, Gamunu Wijetunge, Ashish Panchal, National Registry of Emergency Medical Technicians

Background: The use of continuous and bilevel positive airway pressure (CPAP/BiPAP) is limited to paramedics under the 2007 National EMS Scope of Practice Model. However, state and local practices vary and current national trends of CPAP/BiPAP use by other EMS licensure levels is unknown. Our objective was to describe use and outcomes of CPAP/BiPAP by EMS licensure level nationally. We hypothesized that basic life support (BLS) only agencies use CPAP/BiPAP with similar patient outcomes compared to agencies with advanced life support (ALS) capability. Methods: Using the 2012-2015 National Emergency Medical Services Information Systems (NEMSIS) datasets, we evaluated all records with CPAP/BiPAP use documented by EMS professionals in any agency response versus a response with a combination of BLS and ALS (ALS-BLS). Only 911 responses were included. Variables assessed included patient and response characteristics, and outcomes with procedures performed, and cardiac arrest occurrence. Chi-square tests were used to evaluate differences between BLS-only and ALS-BLS responders. Results: There were 259,099 cases of CPAP/BiPAP use documented during the study period. Of these, 253,728 (98%) were performed by services with ALS-BLS responders. Most patients were 70 years or older (78%) and 49% were male. The most common incident locations were residences (65%) and health care facilities (20%). The proportion of patients treated by BLS-only responders who suffered cardiac arrest after EMS arrival was significantly greater (4% vs. 0.5% for ALS-BLS responders, p < 0.001) with a concomitant increase in the proportion of chest compressions (BLS: 4%, ALS-BLS: 1%, p < 0.001). BLS-only response agencies more frequently upgraded to lights and sirens during transport (7%) than ALS-BLS services. Conclusions: Use of CPAP/BiPAP by EMS agencies with BLS-only response occurred in 2% of cases. BLS-only responders record more cardiac arrest events after EMS arrival than ALS-BLS responders, although the reasons for this finding require further evaluation beyond the scope of this dataset. Rural location and patient population served. This evaluation likely underestimates the use of CPAP/BiPAP by BLS practitioners since the dataset is unable to separate combined BLS-only and ALS-BLS responders. Further research is needed to understand the trends of CPAP/BiPAP use by BLS EMS professionals.

130. Association Between BMI and Return of Spontaneous Circulation in Out-of-Hospital Cardiac Arrest

Caitlin Howard, Jeremy Allen, David Wampler, Hattie McAviney, Justin Smith, David Miramontes, Joan Folk, United States Army and UTHSCSA Category of Submission: Student, Resident, Fellow

Background: Sudden cardiac arrest (SCA) continues to be the leading cause of death in the U.S. Current studies suggest that there is no strong correlation between BMI and resuscitation rates. The objective of this study was to evaluate what effect BMI has on the rate of return of spontaneous circulation (ROSC).

Methods: This was a retrospective review of an in-house cardiac arrest registry containing details of each resuscitation attempted by a large, urban fire-based EMS system. Data was analyzed from January 1, 2013 to August 31, 2016. The BMI recorded was a subjective measurement obtained from the paramedic at the time of data collection. Patients were included in the study if they were at least 15 years of age were available: age, gender, BMI, and outcome (no ROSC vs. ROSC). Patients were excluded if age < 17, no age or gender recorded, no BMI data available, or no outcome available. Patients were divided into four groups based on the recorded BMI (under, normal, over, morbid). An ANOVA test was utilized to analyze continuous variables and a χ2 test was used to analyze categorical variables. Results: There were a total of 771 possible patients. 516 patients were included in the analysis. The mean age of the subjects was 65.08 + 17.96 years with 319 males (61.82%), 64 (12.40%) patients were underweight, 224 (43.41%) patients were normal weight, 168 (32.56%) patients were overweight, and 60 (11.63%) patients were morbidly obese. There was no statistically significant difference in outcome (no ROSC vs ROSC) between the BMI categories (P = 0.37). It is possible that BMI did not have a significant impact on ROSC rates of ROSC in this study. Our study did have limitations. First, the BMI was a subjective measurement and not calculated. Second, the data is from one single system cardiology and may not be extrapolated to other systems.

131. Paramedics Providing Palliative Care at Home: Management of Pain and Breathlessness

Brianne Robinson, Alix Carter, Judah Goldstein, Michelle Harrison, Marianne Arab, Dalhousie University Category of Submission: Student, Resident, Fellow

Background: Palliative care is aimed at alleviating pain and distressing symptoms by offering support. Paramedics routinely respond to palliative patients and can assist with symptom relief. In Nova Scotia, a novel clinical practice was implemented enabling paramedics to assist families with home medications, collaborate with on-scene home care teams, or to administer opiates through an extended EMS scope of practice goal to treat at home if the patient desired. Paramedics comfort with the dose and range of opiates for palliative caring is increasing. Our objective was to describe the paramedic palliation education and consultation practices for the management of pain and breathlessness. Methods: We conducted a retrospective review of 100 consecutive palliative care responses from February 1st to June 30, 2016. An electronic query would fail to cap-
tured assistance with home medications; a manual chart review including standard medication administration. The review revealed the form to be used in conjunction with ketamine and it was conducted to fully capture the care provided. Descriptive analysis was conducted and results were reported with n and % or mean and standard deviation. Results: Study population included 94 unique patients; 6 patients had 2-4 calls and the remaining had one. Paramedics administered medication to 58 (58%) patients, and ketamine (n=18) remained at home and was observed in 42 (40.5%) with no medication. Most common CC was pain; despite this, only 36 (80%) pain patients received treatment and 6 (1.5%) remained at home. Only 12 (44.4%) breathlessness patients received medication. Paramedics assisted with home medication 10 (17.2%), administered from drug kit 27 (77.8%) and both 3 (7.2%). Mean oral morphine equivalent was 13 ± 7.5 mg. Contact with an OnLine Medical Physician (OLMP) occurred during 57 encounters, and was increased when medication was administered 46 (79.3%) compared to no medication 11 (26.2%). Conclusions: Medication administration would be underestimated in an electronic query system without including the use of home medications, management of pain and breathlessness may not be optimized. Pre- and particularly post-medication pain scores would not be reflected in the OnLine Medical Physician (OLMP) when paramedics were not going to administer medication should increase administration and non-transport through increased comfort and confidence.

132. KETAMINE INDICATIONS IN STATEWIDE TREATMENT PROTOCOLS

Christie Fritz, Christina Loporcaro, David Scott, Benjamin Z. Resen, Harvard Medical School Center/Harvard Medical School Category of Submission: Student, Resident, Fellow

Background: Ketamine was discovered in the 1960s, and since that time has been used to treat pain, depression, and excitation during rapid sequence intubation, and breathlessness may not be optimized. Pre- and particularly post-medication pain scores would not be reflected in the OnLine Medical Physician (OLMP) when paramedics were not going to administer medication should increase administration and non-transport through increased comfort and confidence.

133. Manual Syringe Aspiration and Administration of Epinephrine by Emergency Medical Technicians for Prehospital Treatment of Anaphylaxis

Andrew Latimer, Sofia Husain, Jonathan Nolan, Vinod Dosswamy, Thomas Rea, Michael J. McKee, University of Washington Department of Emergency Medicine Category of Submission: Student, Resident, Fellow

Background: In recent years, the costs of epinephrine autoinjectors (EAs) in the United States have increased substantially. In 2014, emergency medical services within a large urban/suburban county in the United States implemented the “Check and Inject” program to treat emergency medical technicians (EMTs) to manually aspirate epinephrine from a single-use 1 mg/mL epinephrine vial using a needle and syringe followed by intramuscular administration of the correct adult or pediatric dose of epinephrine for anaphylaxis or serious allergic reaction. Treatment was guided by an EMT protocol that required a trigger and symptoms. We sought to determine if the “Check and Inject” program was safely implemented by EMTs treating presumed prehospital anaphylaxis or serious allergic reaction. Methods: We conducted a prospective investigation of all prehospital IVs (100% vs. 65%, p = 0.002). This was associated with a significant decline in the proportion requiring prehospital IVs (100% vs. 65%, p = 0.010) and prehospital IV ondansetron (100% vs. 53%, p = 0.002). Significant changes in other prehospital care (p = 0.521) or ED interventions (p = 0.741), length of stay (p = 0.253), hospital admission rates (p = 0.161), or 48-hour ED return visits (p = 0.254) were not observed. Conclusions: The results of this study suggest that the availability of prehospital oral ondansetron increases the frequency of anxiolytic use, decreasing the need for vascular access and improving patient comfort. An increase in other interventions, hospital admissions, or return ED visits was not observed. Despite concern that ondansetron may mask a medical surgical emergency, this study suggests that pediatric patients treated with oral ondansetron prehospital are not at increased risk of symptom-masking and subsequent return ED visits.

135. USE OF A COMMUNITY PARAMEDIC PROGRAM TO ADDRESS HIGH UTILIZERS OF THE 9-1-1 SYSTEM

Thomas Graway, Mario Colella, Steven Riegge, Michael Wright, Medical College of Wisconsin Category of Submission: Student, Resident, Fellow

Background: The role of community paramedics (CP) has been expanding over recent years. Many programs exist across the country, attempting to fill the gaps in the patient care needs of the local community. The Milwaukee Fire Department (MFD) has created a CP program which addresses high utilizers of the 9-1-1 system, attempting to decrease the proportion requiring use of resources and improve patient quality of life. Objective: To determine if enrolling high utilizers of the 9-1-1 system in a one month community paramedic program decreased system usage. Methods: This is a retrospective chart review. Data from MFD’s program in 2016 was reviewed. Study population included 89 patients enrolled in the program, varying from 2-8 patients per month. Data was available and analyzed based on month of enrollment in the program. The proportion of patients from the patients enrolled were reviewed with the 6 months prior to participation compared to
6 months after the program was completed. Total hours of community paramedic contact time ranged from 6 months to 1 year; 10 patients were excluded because they dropped out of the program prior to completion. Results: In all 9 months of implementation there was a drop in time spent providing care. After 6 months of program completion, 2264/2705 patients (83.7%) were enrolled in the program accounting for 337 calls pre-intervention and 149 calls (36%) after 419.8 total hours of CP care were performed. For every 27 minutes of care provided, one less 9-1-1 call occurred. Conclusions: Participation in a community paramedicine program established to decrease 9-1-1 utilization cut use by 56%. Limitations include lack of information about nature of 9-1-1 calls including which calls required hospital transport. A future study could look at cost savings provided by the program.

136. Understanding How Transactional Stress Relates to Stress Reactions and Safety Outcomes
Elizabeth Donnelly, Paul Bradford, Cathie Hedges, Matthew Davis, Doug Socha, Peter Morassutti, University of Windsor Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Increasing attention is being paid to the impact of stress and fatigue on safety in paramedicine. Specifically, empirical linkages have been established between fatigue, chronic work stress, critical incident stress, and safety outcomes. However, the relationship between transactional stresses, stress reactions like post-traumatic stress, fatigue, and safety outcomes (safety compromising behaviours, medication errors and adverse events, and injuries or exposures) have not been assessed. There are two types of transactional stress. Internal transactional stresses are associated with the day to day work environment and personal issues (e.g., being placed on standby, dealing with dispatch, inappropriate use of EMS, mandatory overtime, and dealing with frequent service users). External transactional stressors involve interacting with allied professions (e.g., law enforcement, Base Hospital, ER Charge nurses, ER Physicians, ER primary nurses, and fire fighters.). The purpose of this study was to see if there was significant variation in levels of transactional stress in paramedics that endorsed high levels of posttraumatic stress, fatigue, or reported negative safety outcomes. Methods: An online survey was conducted with ten Canadian paramedic services with a 40.5% response rate (n = 717). T-tests were used to assess for significant differences. Results: Analyses revealed high levels of internal and external transactional stress in those paramedics that endorsed high levels of posttraumatic stress (p < .001), those who reported being fatigued (p < .001), those who reported injuries or exposures at work (internal ambulance stress (p < .05), external ambulance stress (p < .001), safety compromising behaviours, and medication errors (p < .05)). Conclusions: These results indicate that there are higher levels of transactional stress in paramedics that endorsed other pathological levels of posttraumatic stress, significant fatigue, and negative safety outcomes. These exploratory analyses indicate that transactional stress may be modulating the workplace stress of paramedics. The ability to further break down and focus on the specific factors may offer opportunities addressing posttraumatic stress and negative safety outcomes.

137. Prehospital Availability and Use of Medications for Managing Hazmat Emergencies
Kubwimana Myhayaguru, Amber Bel- laflore, Eric Lederer, Carl Youngs, Robert French, Joshua Waters, Frank Walter, The University of Arizona Category of Submission: Student, Resident, Fellow

Background: A minimal amount is known about prehospital availability and use of medications to treat human hazardous materials (hazmat) emergencies. The purpose of this study was to identify the availability and use of hazmat medications among paramedics with advanced hazmat training, practicing in prehospital settings in the United States (U.S.). Methods: An email Qualtrics® survey was sent to U.S. paramedics who completed the Advanced Hazmat Life Support (AHLS®) Provider Course from 1999–2017. The survey asked what specific hazmat medications were available to each respondent, their usage and frequency, and how frequently they had been used. For analysis, responses were grouped into those medications with hazmat indications only and those with multiple uses. Availability and use of each hazmat medication is reported using simple descriptive statistics, including number (n) and percent (%). Hazmat medications were considered to have been used if the surveyed paramedic gave them anytime in the last five years. Results: Of the 4,360 surveys sent, 784 (18.0%) were completed. Of the completed surveys, 279 (35.6%) paramedics had dedicated hazmat medication kits and 505 (64.4%) had hazmat medications carried with other medications. For those hazmat medications with hazmat uses only, availability/use was: cyanide antidotes 463 (59.1%) / 36 (4.6%), atropine + pralidoxime auto-injectors 376 (48.0%) / 5 (0.6%), pralidoxime multi-dose vials 122 / (15.6%) / 3 (0.4%), and methylene blue 103 (13.1%) / 5 (0.6%). The availability/use of hazmat medications with other uses was: atropine 513 (65.4%) / 63 (8.0%), calcium chloride 540 (68.9%) / 36 (4.9%), calcium gluconate 247 (31.5%) / 26 (3.3%), diazepam 498 (63.5%) / 49 (6.3%), lorazepam 262 (33.4%) / 18 (2.3%), midazolam 619 (79.0%) / 29 (3.7%), ophthalmic topical anesthetic 50 (6.4%), and topical lubricating jelly 462 (58%) / 28 (3.6%). Conclusions: Among paramedics with AHLS® Provider training there is limited availability and use of hazmat medications. Although local scope of practice, financial, and other geographic considerations likely contribute to these results, further work is needed to identify which medications might be available to paramedics to optimize the cost benefit ratio of stocking and using hazmat medications.

138. Validation of a Prehospital Falls Risk Assessment Tool
Allison Infinger, Meghan Wally, Rachel Seymour, Jonathan Studnec, Mecklenburg EMS Agency Category of Submission: Trauma

Background: Every 15 seconds an older adult will present to the emergency room with a fall related injury. Several assessment tools have demonstrated efficacy; however, health care providers must be able to identify at risk patients. This study aimed to develop a content valid and reliable assessment of environmental fall risk performed in the prehospital setting. Methods: First, we identified validated items for screening extrinsic factors from the literature. Then, an expert panel completed two rounds of assessment using content validity index (CVI) scores to eliminate items. The remaining items were revised for prehospital use and rates of validation for each to achieve target systolic blood pressure was significantly less in the second round, however
the physiological responses were similar for both rounds. **Conclusions:** A reproducible, stable, and portable porcine model of p-PEA via hypoxic asphyxiation was developed. Time to induction was reduced after multiple insults. This model offers an improved method for testing innovative therapies for p-PEA.

140. CHARACTERISTICS OF ACUTE MYOCARDIAL INFARCTION CASES CODED AS LOW-ACUITY AT DISPATCH

Marie Gardett, Greg Scott, Chris Olola, Meghan Broadbent, International Academies of Emergency Dispatch Category of Submission: CARDIAC

**Background:** Identification of acute myocardial infarction (AMI) can be complicated by the wide variety of symptomologies or presentations. While the most common symptom of AMI is chest pain, so-called “atypical” presentations are in fact quite common and extremely variable, and AMI sometimes presents with very mild-seeming symptoms such as flu-like chills and nausea, abdominal pain, or lightheadedness. Correctly identifying these mild-seeming presentations that actually turn out to be AMIs can help ensure appropriate response and treatment. This study identified hospital-confirmed AMI cases coded as low-acuity in an attempt to determine whether any common characteristics could help identify these cases in the future. **Methods:** This was a retrospective study utilizing emergency medical dispatch (EMD), emergency medical services (EMS), and hospital discharge datasets. The study sample included all cases that arrived to the hospital via EMS. Primary outcome measures were the numbers of hospital-diagnosed AMIs categorized by patient age and gender, Chief Complaint Protocol, and dispatch determinant code; secondary measures were comparisons between EMD- and EMS-recorded symptoms. Descriptive statistics were used to characterize the distributions of all ALPHA-level cases and of ALPHA-level AMIs, categorized by hospital discharge destinations, and Chief Complaint. **Results:** A total of 8,007 ALPHA priority-level cases with corresponding hospital records were identified. Of these, 404 (5%) identified as AMIs. Of the ALPHA-level AMI cases fell into only five Chief Complaint Protocols (Sick Person, Falls, Unconscious/Fainting, Abdominal Pain/Problems, and Other Operations). Older patients tended to discharge to medical facility (rather than to home or self-care) were identified with AMI cases. The most commonly reported symptom was a fall, especially ground-level fall in an older-age patient. Certain “sick person” characteristics were also somewhat associated with AMI diagnosis. **Conclusions:** Overall, the numbers reported to the ALPHA priority level is very low and is confined to very few Chief Complaint Protocols. In general, the ALPHA-coded AMIs in this study showed characteristics associated with typical AMIs widely described in other healthcare settings.

141. HEAT INDEX IS THE MAIN FACTOR INFLUENCING RATES OF PATIENT PRESENTATION AT EAST CAROLINA UNIVERSITY FOOTBALL GAMES

An Truong, Stephen Taylor, Roberto Portela, Keith Bedewer, Brody School of Medicine at East Carolina University Category of Submission: STUDENT, RESIDENT, FELLOW

**Background:** Mass gathering events are large gatherings of greater than 1000 people where access to patients is difficult and response by emergency medical services (EMS) may be delayed. Current literature suggests that multiple factors can influence patient presentation rates during these events. Local emergency medical services (EMS) unit is one field-dedicated EMS unit, and 2 Medical Treatment Areas staffed with four physicians. Cooling tents are used as needed based on weather forecasts for the game.

**Methods:** This study aimed to quantify patient presentation rates and factors influencing patient presentation during ECU football games between 2008 and 2016. **Objective:** The definitive prehospital management of critically-injured blunt or penetrating trauma patients is rapid transport to a trauma center. Retrospective studies of trauma registry data have indicated that prolonged on-scene times may worsen mortality in the most critically-injured patients. The preponderance of available research suggests that optimal management of these patients is the provision of basic stabilization measures while minimizing time spent on-scene. The objective of our study was to investigate if prehospital provider date of hire was associated with time spent on-scene in patients transported emergently with traumatic injuries. **Methods:** We conducted a data analysis of emergent transports of trauma patients by paramedics hired by our EMS agency during the years 2006 through 2015. We examined the on-scene times for these calls as recorded through the agency’s computer-aided dispatch system, from January 2011 to June 2017. We compared the mean on-scene times for paramedics over this period, aggregated by year of hire. We excluded calls in which the provider indicated a specific delay or barrier to care in the electronic patient care report. **Results:** During the study period, paramedics from the included years of hire transported a total of 2,910 emergent trauma patients. The number of emergent trauma transports for paramedics from each year of hire range from 179 to 380. Paramedics with earlier years of hire have lower average on-scene times than those hired later. Paramedics hired in 2006 had average on-scene times of 7.6 minutes, while paramedics hired in 2015 had average 9.14 minutes on-scene. Linear regression of this data yielded an R-squared value of 0.82. Utilizing a one-way between-subjects ANOVA, there was a significant effect of year of hire on average on-scene time, p < 0.05. Linear regression of this data yielded an R-squared value of 0.82. Utilizing a one-way between-subjects ANOVA, there was a significant effect of year of hire on average on-scene time, p < 0.05. Linear regression of this data yielded an R-squared value of 0.82. Utilizing a one-way between-subjects ANOVA, there was a significant effect of year of hire on average on-scene time, p < 0.05. **Conclusions:** There was a distinct association between paramedic year of hire and on-scene times in emergent trauma transports. Further research is needed to determine if this trend is seen in other similar agencies and to investigate its impact on patient outcomes.
Background: Minimizing scene times for patients with critical trauma has long been recommended. Additionally, pain from traumatic injuries is very common. Assessment and management of this pain has been identified as a key clinical performance measure by the EMS Compass Trauma initiative. There has been little existing national data to benchmark these measures. We sought to describe the performance on these measures using a large commercial dataset.

Methods: Using anonymous data from 9-4-1 consenting agencies, we analyzed 6.5-years of data from ESO Solution’s electronic health record (HER) to calculate benchmarks for: (1) the percentage of patients brought to a hospital with an initial pain score >5, the proportion with a second score reassessing pain. Of patients from ALS agencies with an initial score >5, the proportion with decreased pain from the first to last pain score. We calculated both the proportion and 95% Confidence Interval as well as average, median and interquartile range (IQR) for time-based measures. Results: Of the 66,414 critical trauma patients, 16,162 (24.3%, 24.0–24.7%) had a scene time less than 10 minutes. Of those patients, 1,053,747 (48.6%, 48.6–48.7%) had a pain score documented. Of 503,656 patients with initial pain scores of >5, 305,493 (60.7%, 60.5–60.8%) had a reassessment. Of the 310,273 patients of ALS agencies with a score >5, 64,076 (20.6%, 20.5–20.8%) had an improvement in pain scores. Conclusions: We provide the first benchmarks on critical trauma scene times and pain management using a large national dataset. The results indicate additional efforts are needed, both to improve pain management during triage/pain and in addressing it. Additionally, scene times on critical patients are rarely under the “platinum” 10 minutes, indicating either need for improvement or a more realistic goal.

145. STOP THE BLEED: THE EFFECT OF HEMORRHAGE CONTROL EDUCATION ON LAYPERSONS’ WILLINGNESS TO RESPOND DURING A TRAUMATIC MEDICAL EMERGENCY

Derek Brown, Elliot Ross, Theodore Redman, Julian Mapp, Kaori Tanaka, Chetan Kharaod, Craig Cooley, David Wampler, SAUSHEC Military Training Center.

Category of Submission: STUDENT, RESIDENT, FELLOW

Background: The “Stop the Bleed” campaign advocates for non-medical personnel to be trained in basic hemorrhage control. However, it is not clear what type of education or the duration of instruction that is required to meet that condition. The objective of this study was to determine the impact of a brief hemorrhage control educational curriculum on the willingness of laypersons to respond during a traumatic emergency. Methods: This educational initiative was conducted between SEP 2016 and MAR 2017, and subjects were recruited from multiple community groups in a large metropolitan area. Individuals with formal medical certification were excluded. Participants completed a pre- and post-education questionnaire assessing personal comfort levels and their knowledge and attitudes about hemorrhage control as a traumatic emergency. Each training course included 20 minutes of didactic instruction on hemorrhage control techniques, encompassing indications for tourniquet application with tourniquet application on both adult and pediatric mannequins. The primary outcome was willingness to use a tourniquet in response to a traumatic medical emergency. Results: Of 236 participants, 218 met eligibility criteria. When initially asked if they would use a tourniquet in real life 64% (140/218) responded “Yes”. Following training, 194 participants responded that they would use a tourniquet in real life. Of participants who initially responded No (2%, 6/218), all responded “Yes” following training. Before training, men were statistically more likely to respond “Yes” to using tourniquets than women (80.9% vs. 57.1%, p = 0.005), but that difference resolved following training. When participants were asked about their comfort level with using a tourniquet in real life, there was a statistically significant improvement between their initial and post-training responts (p < 0.001). Conclusions: In this hemorrhage control education study we found that a short educational intervention can improve laypersons’ perceived ability and reported willingness to use a tourniquet in an emergency. Significant gender differences exist in the stated willingness to respond in emergencies. Identified barriers to responding were based when designing future hemorrhage control public health education campaigns. Community education should continue to be a priority of the “Stop the Bleed” campaign.

146. CAN PREHOSPITAL PROVIDERS CORRECTLY TRIAGE PATIENTS TO FREESTANDING EMERGENCY DEPARTMENTS?

Charles Hwang, Desmond Fitzpatrick, Jason Jones, University of Florida Department of Emergency Medicine

Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Freestanding emergency departments (FSEDs) are equipped to care for most non-traumatic medical emergencies but do not have all the resources of FSEDs and to predict the need for hospital admission. Inappropriate triage can result in delay in definitive care. We sought to determine which patients are appropriate for FSEDs and to predict the need for hospital resources.

Methods: We conducted a retrospective analysis of OHCA events occurring at one community hospital. Over a two-year period, data was collected on OHCA events and the discharge status of the patient. FSEDs treated 243 patients (male for 82%, witnessed arrest for 61%) who had cardiac arrest. Of these patients, 100 vs. 65.1% for good CPC; and 100 vs. 65.1% for good CPC

147. OUTCOME IMPACTS OF COMMUNITY BYSTANDER DEBILITATION VERSUS DISPATCHER-ASSISTED CPR (DA-CPR) IN OUT-OF-HOSPITAL CARDIAC ARREST AT PUBLIC LOCATIONS

Patrick Chow-In Ko, Shih-Chieh Huang, Yu-Wen Chou, Hong-Yi Hsiao, Ming Ma, Chung-Liang Shih, National Taiwan University, College of Medicine, Department of Emergency Medicine

Category of Submission: CARDIAC

Background: We compared the outcomes between FSEDs and public locations. Results: Among a total of 6,356 OHCA, 627 patients occurred at public locations, including 28 patients (male for 82%, witnessed arrest for 79%) received bystander aid by public AEDs plus CPR rescue and 243 patients (male for 64%, witnessed arrest for 61%) received dispatcher-assisted CPR. For these 28 patients, 53.6% (15/28) achieved prehospital ROSC at scene or during transport, 71.4% (20/28) achieved sustained ROSC. AEDs plus CPR rescue and 243 patients (male for 64%, witnessed arrest for 61%) achieved dispatcher-assisted CPR.
were significantly higher than those associated with dispatcher-assisted CPR program.

148. Randomized Trial of a Shear Reduction Surface in Ambulance Transport


Background: Shear is a known risk factor in pressure sore development, such as decubitus ulcers. The purpose of this study is to examine the effectiveness of an anti-shear mattress overlay (ASMO) in reducing shear/pressure and pressure injury development such as decubitus ulcer.

Methods: This was a randomized, cross-over design. Thirty adult volunteers in 3 BMI categories served as their own controls. PRE-DIA shear pressure sensors were applied to the sacrum, ischial tuberosity (IT), and heel. The stretcher was placed in sequential 0°, 15°, and 30° elevations, with and without ASMO. The stretcher was rolled over a closed course achieving 30 mph, with 5 complete stops at each head of bed elevation for a total of 900 trials. Subjects rated discomfort on a 0–10 scale each hour.

Results: Peak shear difference between surfaces was −0.89, indicating that after adjusting for elevation, sensor location, BMI, starting peak shear levels were 0.89 Newtons (N) lower for ASMO compared with standard surface (p = 0.057). Compared with 0°, elevations of 15° and 30° increased these levels by 2.41N (p < 0.001) and 3.44N (p < 0.004, respectively). Using the sacrum as the reference, IT and heel had increased shear levels of 2.54N (p < 0.001) and 1.01N (p = 0.079), respectively. Peak pressure difference between surfaces was −1.69, indicating pre-run peak pressure levels were 1.69 mmHg lower for ASMO compared with standard surface (p = 0.070). Discomfort was lower on ASMO than standard surface at 0° and 30° (p = 0.004, p = 0.014). Both surfaces had increased discomfort moving from 0° to 30° (p = 0.005 and 0.039, respectively). Conclusions: ASMO reduced shear and discomfort. Further study needs to be done assessing transport attention should particularly be given to the heels and head of bed elevation.

149. Sleep Disorders Are Common Risk Factors for Occupational Injury

Matthew Weaver, Jason Sullivan, Conor O’Brien, Salim Qadri, Charles Czeisler, Laura Barger, Brigham and Women’s Hospital and Harvard Medical School Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: The rate of occupational injury in EMS is high and crashes are common. Fatigue has been identified as an important risk factor. Sleep disorders are more common, even compared to other risky industries. We sought to examine the prevalence of common sleep disorders and their impact on occupational safety.

Methods: A nationwide cross-sectional study collected data from 66 fire departments across the US who participated in a workplace-based sleep disorders screening and education program. Participants were screened for common sleep disorders using reliable and valid screening questionnaires and asked a series of questions about adverse safety outcomes which occurred in the past month. The cooperation rate was 58.6%. For this secondary analysis, the dataset was limited to participants who reported their primary responsibility as medical care and listed an EMT-Basic or higher certification. The prevalence of common sleep disorders is reported using descriptive statistics. The association between sleep disorders and adverse outcomes is analyzed using univariable and agency-level risk factors, including age, gender, body mass index, exercise frequency, years of experience, shift schedule, work at multiple jobs, and annual call volume. Results: Responses were obtained from 2,992 fire-based EMS providers employed at 65 departments. Most were male (93%), full-time employees (95%), with 12 years of experience (77%). One in three was obese (33.2%). Nearly half (45.1%), screened positive for at least one sleep disorder. Over 1/3 (33.9%) screened positive for obstructive sleep apnea, 7.5% screened positive for sleep disorders using reliable and valid screeners. We sought to examine the prevalence of common sleep disorders and their impact on occupational safety. We hypothesized that provider recognition and perception of threatening situations would not differ given different patient presentations or aggressors.

Methods: Using four-scenario simulations, we assessed providers from prehospital providers, EMS educators and law enforcement training staff developed four simulation scenarios to assess provider responses to threatening situations. Each scenario involved patient presentations and distractions that simulated common high-stress EMS encounters. The scenarios were standardized for timing (8 minutes) and distinct phases of escalation (e.g., entrance of distractor, physical contact with patient, physical contact with crew), with the same data elements collected. The scenarios used actors and a realistic, video-recorded environment. Role players and evaluators attended a week-long course to standardize simulation performance and assessment. Providers were told that they were participating in a “patient care scenario” but otherwise blinded to the purpose of the simulation. Each provider participated in a single scenario as a member of a flight crew. The evaluator to participant ratio was 1:1. Characteristics were compared using chi-square tests.

Results: A total of 272 EMS providers were evaluated across three scenarios: domestic abuse (n = 94, 35%), possible overdose (n = 44, 16%), deceased mother (n = 68, 25%), and intoxicated homeless person (n = 66, 24%), with <3% missing data across elements. There were no differences in participant characteristics by scenario: certification levels (p = 0.96), sex (p = 0.28), and years of EMS experience (p = 0.86). Most providers felt their scenario was realistic (n = 219/265, 83%) and this rating did not differ across scenarios (p = 0.08). Overall, 65% (n = 170/269) of providers stated that if the scenario had happened in real life, they would have felt threatened, with no difference across scenarios (p = 0.31). Conclusions: We created and validated four realistic scenarios for prehospital providers that simulated threatening patient encounters with standardized phases of escalation and data collection points. Future research should focus on evaluating the impact of these scenarios on provider preparedness during real-life patient encounters.

150. Effectiveness of Manual Ventilation in Intubated Helicopter EMS Transported Trauma Patients

Timothy Lenz, Brett McLachlan, Craig Bilbrey, Keith Mausner, Medical College of Wisconsin Category of Submission: Trauma

Background: Helicopter EMS agencies are frequently asked to transport intubated trauma patients to a trauma center. There is no current evidence to inform the decision of ventilation in this population. Current practice varies by group. We hypothesized that controlling for potentially confounding variables, positive sleep disorder screening was independently associated with more than twice the risk of occupational injury (OR 2.04, 95% CI 1.48–2.81), motor vehicle crash (OR 2.10, 95% CI 1.12–3.93), and near crash (OR 2.27, 95% CI 1.94–2.66). Conclusions: Sleep disorders are highly prevalent among EMS providers. Sleep disorder screening may help to identify providers who are vulnerable to adverse safety outcomes.

151. Development and Validation of Reality-Based Training Scenarios Simulating Violent EMS Encounters

Mallory Deluca, Donald Garner, Jr, Remle Crowe, Rebecca Cash, Madison Rivard, Jeffrey Williams, Anish Panchal, Jose Cabanas, Wake County EMS Category of Submission: Professional

Background: Emergency Medical Services (EMS) providers are often exposed to violence during patient encounters. Traditional EMS training may not adequately address appropriate responses to potentially threatening situations. Our objective was to develop and validate scenarios to evaluate EMS providers’ responses to threatening situations. We hypothesized that provider recognition and perception of threatening situations would not differ given different patient presentations or aggressors.

Methods: Using four-scenario simulations, we assessed providers from prehospital providers, EMS educators and law enforcement training staff developed four simulation scenarios to assess provider responses to threatening situations. Each scenario involved patient presentations and distractions that simulated common high-stress EMS encounters. The scenarios were standardized for timing (8 minutes) and distinct phases of escalation (e.g., entrance of distractor, physical contact with patient, physical contact with crew), with the same data elements collected. The scenarios used actors and a realistic, video-recorded environment. Role players and evaluators attended a week-long course to standardize simulation performance and assessment. Providers were told that they were participating in a “patient care scenario” but otherwise blinded to the purpose of the simulation. Each provider participated in a single scenario as a member of a flight crew. The evaluator to participant ratio was 1:1. Characteristics were compared using chi-square tests.

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152. Paramedics Providing Palliative Care at Home: An Evaluation of Paramedic Comfort and Confidence in Providing Palliative Support

Alix Carter, Judah Goldstein, Marianne Arab, Michelle Harrison, Wilma Crowell, Katherine
Conclusion: Although confounders such as aspiration prior to airway placement may exist, these data suggest that patients receiving mechanical ventilation via the King-LTD in addition to mechanical ventilation have similar incidence of prehospital and in-hospital complications.

154. The Effect of IV vs IO Access in Prehospital Cardiac Arrest ROSC Rates

Colby Redfield, Stephen Suarez, Jessica Daniels, Cristina Sanchez, Heidi Siples, Kim Landry, Leon County EMS Category of Submission: Cardiac

Background: The prevailing standard of care in prehospital emergency medical services is that endotracheal intubation (ETT) or SGA is the preferred route for obtaining vascular access and delivery of resuscitation medications and volume expanders in cardiac arrest patients. We sought to determine whether routine use of IO access in addition to ETT or SGA is associated with improved ROSC or survival to hospital discharge in cardiac arrest patients.

Methods: Of 137 cases meeting inclusion criteria, patients were randomized to receive IO access with or without ETT or SGA. The primary outcome was intra-arrest end-tidal carbon dioxide (etCO2) measurements. We also examined ventilation rates, vital signs at return of spontaneous circulation (ROSC), and survival to hospital discharge.

Results: Of patients with ROSC in the ED, 33.3% had a SGA placed. Twenty-eight (22.6%) achieved ROSC. In-hospital data were available for 13 (10.3%) patients. There were no group differences in etCO2 values during arrest, vital signs upon ROSC or ED arrival, or arterial or venous partial pressure of oxygen, partial pressure of carbon dioxide, partial pressure of carbon dioxide, or pH levels in the ED. There were no group differences in ROSC or survival at 24 hours, 30 days, or 90 days.

Conclusions: We detected no differences in clinical markers of oxygenation, ventilation, or perfusion and no differences in survival for OHCA patients managed with an ETT or SGA in combination with MCPR.

155. The Use of Airway Simulation Scenarios to Augment Systematic Quality Improvement Initiatives in a Fire-Based EMS Agency

Eric Cortez, Tyler Smith, Andrew Little, Rich Latham, William Krebs, James Davis, David Keseg, Ohio Health Doctors Hospital Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Airway simulation for prehospital care providers has several potential benefits: provider exposure to low-frequency procedures and identification of systemic quality improvement concerns. The objective of this study was to evaluate two airway simulation scenarios during a two-hour paramedic airborne course. We hypothesized that the simulation scenarios would identify areas of focus for future quality improvement initiatives. This study had a prospective evaluation of parameters in an all advanced life support (ALS) fire-based emergency medical services (EMS) system during two co-located airborne simulation training courses.

Results: Airway simulation for prehospital care providers has several potential benefits: provider exposure to low-frequency procedures and identification of systemic quality improvement concerns. The objective of this study was to evaluate two airway simulation scenarios during a two-hour paramedic airborne course. We hypothesized that the simulation scenarios would identify areas of focus for future quality improvement initiatives. This study had a prospective evaluation of parameters in an all advanced life support (ALS) fire-based emergency medical services (EMS) system during two co-located airborne simulation training courses.
eral pre-intubation and post-intubation assessments. The primary outcome was successful endotracheal intubation. Secondary outcomes included several pre-intubation and post-intubation assessment and management steps. Descriptive statistics were calculated with medians with interquartile ranges (IQR) and proportions. Results: A total of 375 paramedics participated in 61 trauma scenarios and 74 heart failure scenarios. The median number of self-reported successful intubations in the previous six months was 1 (IQR 0–2). Successful intubation was achieved in 59 (79%) of the trauma scenarios and 73 (99%) of the heart failure scenarios. End-tidal capnography confirmation was performed in 60 (98%) of the trauma scenarios and 73 (99%) of the heart failure scenarios. Preoxygenation was performed in 60 (98%) of the trauma scenarios and 72 (97%) of the heart failure scenarios. Basic airway maneuvers (positioning, suctioning) were performed in 13 (21%) of the trauma scenarios and 1 (0.7%) of heart failure scenarios. In the heart failure scenario, allergies were reviewed in 10 (13.5%) encounters, and endotracheal tube dislodgement was recognized in 57 (77%) encounters. Conclusions: This study found high intubation success rates during the simulated scenarios, while other tasks, such as basic airway maneuvers and reviewing allergies, were performed at lower than expected rates. Developing quality improvement initiatives is challenging for low-frequency procedures. This study exemplifies the utility of airway assessment helps in developing quality improvement initiatives for large EMS agencies.

157. INCIDENCES OF ADVERSE REACTIONS SECONDARY TO THE ADMINISTRATION OF HYDROXOCOBALAMIN FOR SUSPECTED CYANIDE POISONING IN THE PREHOSPITAL SETTING

Albert Arslan, Doug Isaas, Pamela Lai, Matthew Melamed, Glenn Asaeda, David Prezant, Fire Department City of New York and Northwell Health EMS Fellowship CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: The objective of this study was to assess the incidences of adverse reactions secondary to hospital administration of hydroxocobalamin to patients with suspected cyanide poisoning after exposure to smoke inhalation. Exposure to fires involves a high morbidity and mortality, in part by the cellular asphyxiant cyanide - a byproduct of the combustion of synthetic materials. Hydroxocobalamin, one of the most common antidotes, combines with cyanide to form a nontoxic metabolite. Since 2009, our department has administered hydroxocobalamin in 239 cases, creating one of the largest prehospital case series for a single agency. Methods: This is a retrospective analysis of adverse reactions secondary to hospital care reports as well as hydroxocobalamin-specific questionnaires. Patients were separated into two study populations: those in cardiac arrest, and those that were not. No patient reported difficulty breathing, mental status, seizures, coma, or hypotension of unknown etiology. Patients received 1.25–5 grams of hydroxocobalamin intravenously. Adverse reactions recorded included erythema, nausea, seizures, headaches, allergic reactions, or increased blood pressures. Results: A total of 347 patients with ages ranging from 2 to 99 years and a median age of 52 years, of whom 58% were male, were administered hydroxocobalamin. Patients in cardiac arrest comprised 36.8% of the patients studied and were excluded from the study. For the remaining patients, one was observed to have nausea and another with post-administration seizures. An increase in blood pressure was noted in 42.4% of the patients, with a change in systolic measurements between 1–106 mmHg with a mean change of 13.9 mmHg (median 7 mmHg, SD = 17.6 mmHg) and change in diastolic measurements between 1–77 mmHg with a mean change of 19 mmHg (median 10 mmHg, SD = 24.8 mmHg). Of these, 7.9% experienced a clinically significant increase in blood pressure requiring intervention greater than 180/110 mmHg. Conclusions: The administration of hydroxocobalamin was associated with a low incidence of previously reported adverse reactions when given in the prehospital setting for the treatment of suspected cyanide toxicity. Limitations for this study include its retrospective nature and its lack of hospital patient outcomes.

158. BIS: BISPECTRAL INDEX MONITORING FOR PATIENTS DURING OUT-OF-HOSPITAL CARDIAC ARREST

Ralph Frascone, Jeffrey Anderson, Joseph Pasquarella, Nicholas Loken, Sandi Wewerka, Regions Hospital EMS CATEGORY OF SUBMISSION: CARDIAC

Background: Progress in the treatment of OHCA has resulted in a need to rapidly determine the likelihood of neurological viability in patients during CPR. End tidal (Et) CO2 levels have been used as a measure of circulation during CPR, however, EtCO2 is not predictive of neurological recovery. Based upon studies in our animal laboratory, we hypothesize that measuring processed electroencephalography (EEG) during CPR can be used together with EtCO2 to determine if there are signs of brain electrical activity that may predict neurologically intact recovery from a cardiac arrest. The primary research question was to determine if EEG activity alone or in combination with another non-invasive measurement, EtCO2, could be used to predict the return of spontaneous circulation (ROSC). Methods: This is a prospective, pre-hospital, cohort study to determine the relationship between EtCO2 and BIS. Paramedics from three agencies were trained in the application of a modified protocol and applied as early as possible during resuscitation. BIS was recorded until the patient achieved ROSC or was pronounced dead. The BIS monitor transforms the EEG waveform into a dimensionless percent range from 0 (complete cerebral suppression) to 100 (fully awake and alert). Data was analyzed using descriptive statistics and unadjusted logistic regression. Results: Forty-two patients with BIS measurements were enrolled. (ROSC) was achieved in 13 patients (31%). Neither BIS at initiation of CPR (p = 0.513) or EtCO2 nadir (0.075) was significantly associated with ROSC. 29/40 (73%) died prior to or during transfer to the ED. BIS measures at initiation of CPR (p = 0.973) or at nadir (0.285) were not significantly associated with mortality. 2/11 patients who survived the ED transfer had BIS measures that fell below 5%. Similarly, among 40 patients with available data, EtCO2 at initiation of CPR (p = 0.872) or EtCO2 nadir did not significantly predict ROSC outcomes (p = 0.995; pnadir = 0.416) or mortality (p = 0.727; pnadir = 0.533). Using ETCO2 to determine if a patient experienced a clinically significant increase in blood pressure that resulted with a value greater than 180/110 mmHg. Conclusions: The administration of hydroxocobalamin was associated with a low incidence of previously reported adverse reactions when given in the prehospital setting for the treatment of suspected cyanide toxicity. Limitations for this study include its retrospective nature and its lack of hospital patient outcomes.

159. DESCRIPTIVE ANALYSIS OF PATIENTS ADMINISTERED NALOXONE BY PREHOSPITAL PROVIDERS

Eric Cortez, Kaitlin Bowers, Judd Shelton, Andrew Little, Robert Lowe, Sam Kotran, Ohio Health Doctors Hospital CATEGORY OF SUBMISSION: MEDICAL

Background: Emergency medical services (EMS) providers are administering naloxone more frequently and at higher doses. The objective of this study was to analyze patients that received naloxone by EMS providers. We hypothesized that a proportion of prehospital patients were administered naloxone in the absence of apnea. Methods: This was a retrospective study of patients that received prehospital naloxone between October 1, 2015 and March 31, 2016. All patients administered naloxone and transported to emergency departments (EDs) within the study’s healthcare system were included. Patients were excluded if they were transported to EDs outside of the healthcare system. The primary outcome was the presence of prehospital apnea before naloxone administration. Secondary outcomes included the proportion of patients diagnosed with opioid overdose in the ED, and the presence of prehospital unresponsiveness, miosis and hypoxia (< 94% pulse oximetry). Data points were defined a priori and a standardized data sheet was used. Data were reported as percentages, and medians with interquartile ranges (IQR). Results: A total of 150 patients were included. The median age was 45 years (IQR 31–56), and 61% were males. The most common naloxone doses were 2 mg (54%), 4 mg (26%), and 6 mg (7.2%). Of 347 patients with available prehospital physical exam findings, 65% (227) were oversedated in 27%, unresponsiveness in 56%, miosis in 51%, and hypoxia in 17%. Final ED diagnosis was available for 284 patients, and 128 (45%) were diagnosed with opioid overdose. Conclusions: In this study, a proportion of EMS patients received naloxone in the absence of apnea and other signs of opioid toxicity. Furthermore, over half of the patients were not diagnosed with opioid overdose in the ED. This data highlights several important considerations for EMS naloxone administration: obvious opioid toxicity (vs. ventilated overdose), endpoints of therapy (reversal of apnea vs. confusion), need for re-dosing (potent opioid toxicity vs. non-opioid overdose with partial response), and the role of naloxone administration in the setting of medical or traumatic emergencies. Limitations include a high number of missing ED diagnoses, and exclusion of patients transported to other hospitals.

160. CAN GRIP TECHNIQUE AND BAG SIZE IMPROVE VOLUME DELIVERED WITH A BAG-VALVE-MASK BY EMS PROVIDERS?

Melissa Kroll, Jyotirmoy Das, Jeffrey Siegel, Washington University/Barnes-Jewish Hospital CATEGORY OF SUBMISSION: MEDICAL

Background: Emergency Medical Services (EMS) providers rely on the bag-valve-mask (BVM) to provide life-saving positive pressure ventilation in the prehospital setting. Multiple emergency medicine and critical care studies have shown that lung-protective ventilation protocols reduce mortality and morbidity. A recent study has shown that the volumes typically delivered by EMS professionals with the adult BVM are often higher than recommended by lung-protective ventilation guidelines. Our primary objective was to determine if a group of EMS professionals could reduce the volume delivered by adjusting the way the BVM was held. Secondary objectives included (1) if the
adjusted grip allowed for volumes more consistent with lung-protective ventilation strategies and perhaps the equivalent to similar strategies used with a smaller BVM. Methods: A patient simulator of a head and thorax was used to record respiratory rate, tidal volume, peak pressure, and minute volume delivered by participants for 1 minute each across six different scenarios: three different grips (using the thumb and either three fingers, two fingers, or one finger) with two different sized BVMs (adult and pediatric). Trials were randomized by blindly selecting a paper with the scenario listed. A convenience sample of EMS providers was selected from EMS provider and research staff availability. Results: We enrolled 50 providers from a large, busy, urban hospital-based EMS agency a mean 8.60 (SD = 9.76) years of experience. Median volumes for each scenario were 836.0mL, 834.5mL, 794mL for the adult BVM (p = 0.003) and 576.0mL, 571.5mL, 547.0mL for the pediatric BVM (p < 0.001). A mean of 140 adjusted grip allowed for volumes more within the recommended volume range for a 70kg patient (46.4% vs 0.4%; p < 0.001) with only a 1.1% of breaths below the recommended volumes. Conclusion: The study suggests that it is possible to alter the volume provided by the BVM by altering the grip on the BVM. The tidal volumes recorded with the pediatric BVM were more consistent with lung-protective ventilation volumes.

161. Retrospective Refinement and Validation Incorporating the Hypoglycemia Decision Tool for Paramedics
Julie Sinclair, Michael Austin, Shannon Leduc, Zachary Cantor, Richard Dionne, Penny Price, Justin Maloney, Andrew Reed, Andrew Willmore, Valerie Charbonneau, Chuan Wang. University of Toronto/Regional Paramedic Program for Eastern Ontario Category of Submission: MEDICAL
Background: Hypoglycemia symptoms are often treated by paramedics in the prehospital environment. Some evidence suggests that not all patients require transport to hospital; repeat access to paramedics/ED care, or death, occurring within 72 hrs of the initial prehospital hypoglycemic event. The hypoglycemia decision tool (HDT) incorporates the following variables: on insulin, not on corticosteroid/oral diabetic agent, no seizure disorder or cardiovascular disease, and given CHO/protein. We performed descriptive, logistic regression analysis and test characteristics of the decision tool. Results: There were 392 included patients with the following characteristics: mean age 57.5 yrs (SD 13.9 yrs), diabetic 72.9%, on insulin 60.2%, oral diabetic agents 10.7%, > 1 paramedic encounter 18.6%; 247 (63.0%) were transported to hospital and 57 (14.5%) were admitted; 34 (8.7%) had repeat access to paramedic/ED care. A significant association was found between these patient characteristics and short-term events, renal disease, liver disease, homelessness and on chemotherapy agent; 60 (15.3%) patients met the revised hypoglycemia decision tool for non-transport. Of these, 45 (75%) were transported to hospital and all were discharged from ED with no additional management for hypoglycemia; 6.7% had repeat access to paramedics/ED care for hypoglycemia, but none were admitted. The sensitivity of the hypoglycemia decision tool was 93.3%, specificity 17.8%, PPV 25.0%, NPV 90.0%. Conclusions: Demonstrating high sensitivity and low specificity may be potentially safe to rule out transport to hospital following paramedic care for prehospital hypoglycemia. Further research is needed to prospectively validate the HDT’s impact on prehospital and healthcare systems.

162. FALL RISK INVENTORY by Paramedics
Predicts Future Hospitalization and ED Utilization by Elders
Ryan Carter, Joanne McGovern, James Dziura, Fangyong Li, Geleni Gan, David Cone, Sandy Bogucki. Yale University Category of Submission: MEDICAL
Background: One-third of community-dwelling elders fall each year. Previous work showed that more than half of elders who fall and activate EMS for “lift assists” without transport will activate EMS again within 30 days. We sought to refine and validate a decision tool derived to identify patients that could safely be discharged from EMS and home care without transport following successful reversal of symptoms. We conducted a health record review of paramedic care for prehospital hypoglycemia. A significant association was found between symptom presentation and hypoglycemia (p < 0.0001) whereas bystander-witnessed arrest cases (only 13%) were not (p = 0.85). Still, in 95% of cases, the arrest was first identified by a bystander prior to EMS arrival and, contrary to previous studies (with lower reported frequencies of bystander CPR), chest compressions were performed by bystanders in 89% of cases. The earlier CPR was provided by EMS personnel was itself (significantly) associated with ROSC, HA and SURV (all p < 0.0001), but some form of treatment before EMS arrival was provided in 54% of cases and such actions were strongly associated with ROSC, HA and SURV (p < 0.0001 for all 3 outcomes) whereas AED placement (50% of cases) was not. Conclusions: Although “witnessed arrest” cases and AED placement were not identified as contributing factors in this subpopulation of cardiac arrests (likely reflecting infrequent ventricular or dysrhythmia etiologies), as expected, shorter elapsed intervals from the moment of arrest to EMS activation performance significantly correlated with EMS arrival; and, most importantly, any treatment provided before EMS arrival, all resulted in significantly higher rates of ROSC, hospital admission and survival beyond hospital discharge.

164. Adherence to Quality CPR Principles During the EMS to ED Handoff in Simulated Pediatric Cardiac Arrest
Ariel Cohn, Jen Anders, Jordan Duval-Arnold. UCSD Category of Submission: PEDIATRIC
Background: The aim of this study is to quantitatively evaluate adherence to 2015 AHA guidelines for quality CPR during the transition of patient care from EMS to ED. We hypothesized that quality would be compromised during this complicated period; as measured by pauses in chest compressions. Methods: We simulated the handoff and resuscitation of a pediatric patient in a tertiary pediatric ED using EMS and hospital volunteers. This was a pilot study conducted over two, four hour sessions, where as many simulations as possible were run. Simulations were conducted in one of the prehospital gurney in the ER hallway and continued through first 10 seconds of dedicated compressions from the emergency department bed. CPR recording defibrillators collected CPR data (chest compression pauses (sec), rate (cc/min), depth (in) and CC fraction (CCF, %) throughout the scenario.

Paul Banerjee, Paul Pepe, Amin Singh, Latha Ganti, Polk County Fire Rescue Category of Submission: PEDIATRIC
Background: To determine which factors had the strongest association with good outcomes after pediatric out-of-hospital cardiac arrest (POHCA) since 2010 when clinical practice guidelines became more aligned with those used for adults. Methods: We conducted a large EMS urban/suburban jurisdiction that uses a comprehensive Utstein-style database, all POHCA cases encountered over 5 calendar years (January 1, 2012 through December 31, 2016) were analyzed for associated outcomes following full implementation of the latest (2010) international guidelines for childhood basic and advanced life support. The analysis was used to identify current predictors for return of spontaneous circulation (ROSC), hospital admission (HA) and survival to successful hospital discharge (SURV). Logistic regression models of traditional predictors were performed using JMP 12.0 for Mac. Results: Of 133 consecutive POHCA cases studied, the interquartile range for response intervals was 16 to 47 minutes (range: 0–490) and the majority presented with asystole. As traditionally predicted, shorter times from arrest to EMS arrival were significantly more likely with ROSC, HA and SURV (all p < 0.0001) whereas bystander-witnessed arrest cases (only 13%) were not (p = 0.85). Still, in 95% of cases, the arrest was first identified by a bystander prior to EMS arrival and, contrary to previous studies (with lower reported frequencies of bystander CPR), chest compressions were performed by bystanders in 89% of cases and such actions were strongly associated with ROSC, HA and SURV (p < 0.0001 for all 3 outcomes) whereas AED placement (50% of cases) was not. Conclusions: Although “witnessed arrest” cases and AED placement were not identified as contributing factors in this subpopulation of cardiac arrests (likely reflecting infrequent ventricular or dysrhythmia etiologies), as expected, shorter elapsed intervals from the moment of arrest to EMS activation performance significantly correlated with EMS arrival; and, most importantly, any treatment provided before EMS arrival, all resulted in significantly higher rates of ROSC, hospital admission and survival beyond hospital discharge.
Qualitative assessment was performed using video recording and post-simulation partici-
pan survey on emergency medicine board pa-
tial confounding factors. An independent variable was the number of pauses in chest compression longer than 10 seconds. Secondary outcomes include analy-
sis of depth and rate of compressions and qual-
ity of compressions from participants adjusted for medical.
Results: A total of 16 simulated resuscitations were analyzed, with a total of 16 minutes of CPR. Only two simulations, each had a total pause longer than 10 sec-
onds. Average depth of compressions ranged from 0.5–1.2 in. Average rate ranged from 107–146 cm/min, with the majority of compressions between 100–120 cm/min. Conclu-
sion: CPR during EMS to ED handoff did not have an issue with prolonged pauses. How-
ever, the majority of the resuscitation did not meet the 100–120 cm/min goal.
Resuscitation should be reassessed to improve resuscitation quality.

165. FACTORS ASSOCIATED WITH PEDIATRIC
INTERFACILITY TRANSFER FROM EMERGENCY
DEPARTMENTS
Ali Aledhadh, Jon Mark Hirshon, Jennifer Fishe, Jennifer Anders, University of Maryland Department of Emergency Medicine CATEGORY OF SUBMISSION: PEDIATRIC
Background: In regionalized health systems, pediatric patients often require interfacility transfer (IFT) from an initial emergency care to a second acute care facility to reach definitive care. The frequency and number of these transfers have increased over the past several decades. Objective: To determine factors associ-
ated with the likelihood of IFT from the ED.
Methods: A retrospective chart review of pediatric patients 0–17 years of age presenting to one of two suburban/urban academic EDs from October 2011 to June 2015 was performed. The sample size was calculated at 92 patients with a 95% confidence interval and 80% power to detect a difference of 25% in the proportion of patients transferred. Statistical analysis was performed using STATA software. Results: The incidence of IFT was 1.4% of 20,882 consecutive pediatric ED patients. IFT was associated with patients older than 12 years of age and patients with an initial diagnosis of trauma. In the adjusted multivariable logistic regression model, age, gender, race, and insurance status were included as covariates. The ORs of IFT were 1.35, 2.48, and 3.54 for 5–9yo, 10–14yo, and 15–17yo, respectively. Compared to 0–4 yo, the ORs of IFT were 1.35, 2.48, and 3.54 for 5–9yo, 10–14yo, and 15–17yo, respectively. Five percent of all children transferred had a diagnosis of trauma.

166. PARAMEDICS’ PERCEPTIONS OF FOCUSED
POINT OF CARE CARDIAC ULTRASOUND
John Reynolds, Juan March, Roberto Portela, Steven Taylor, Bryan Kitch, Department of Emer-
gency Medicine, Division of EMS, Brody School of Medicine, East Carolina University CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW
Background: Focused point of care cardiac ultrasound (FOCUS) has been used success-
fully in screening for many life threatening emergencies such as cardiac standstill, pericar-
dial effusion, and cardiac arrest. However, there has been limited research on paramedics’ ability to per-
form FOCUS, but none looking at their per-
ceptions. The goal of this study was to evalu-
ate paramedics’ perceptions of FOCUS before and after an educational intervention.
Methods: A prospective study was performed in a suburban/urban setting with a population of 180,000 and 26,000 EMS calls annually. Over a six month period a convenience sample of fire-based paramedics were recruited. The paramedics attended a 60 minute ultrasound lecture and practicum. An emergency medicine trained physician educated in basic ultrasound delivered the educational intervention to the paramedics. A survey was completed by the paramedics before and after the educational intervention. Results: Almost all (87 of 90) paramedics (96%) completed the pre-survey, education interven-
tion, and the post-survey. Pre-survey only 2 of 27 paramedics felt comfortable performing and reading a FOCUS during a cardiac arrest compared to 23 of 27 post-survey, p < 0.001. Pre-survey 5 of 27 paramedics agreed that the cost of FOCUS justifies the ben-
efits as compared to 21 of 27 post-survey, OR = 8.3, 95% CI: 2.4–28.4. Almost half (13 of 27) of the paramedics thought that FOCUS performed by paramedics during cardiac arrest would be easy to perform based on the pre-survey, com-
pared to 24 of 27 on the post-survey, OR = 8.6, 95% CI: 2.1–35.6. Pre-survey the majority of paramedics (19 of 27) already believed that they should be using ultrasound in the ED setting and in the post-survey that number increased to 25 of 27, p < 0.008. Conclusions: This study suggests that without previous edu-
cation, paramedics are not comfortable using ultrasound and believed FOCUS was not cost effective. Yet, after a brief educational inter-
vention, paramedics’ perceptions significantly changed.

167. PARAMEDICS CAN SUCCESSFULLY PERFORM
CARDIAC ULTRASOUNDOGRAPHY UTILIZING THE
PARASTERNAL LONG AXIS APPROACH
John Reynolds, Juan March, Roberto Portela, Steven Taylor, Bryan Kitch, Department of Emer-
gency Medicine, Division of EMS, Brody School of Medicine, East Carolina University CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW
Background: Focused point of care cardiac ultrasound (FOCUS) has been used success-
fully in screening for many life-threatening emergencies such as cardiac standstill, peri-
cardial effusion, and others. There has been limited research on paramedics’ ability to per-
form FOCUS, but none specifically com-
paring paramedics’ ability to utilize different cardiac views. This study aimed to determine if paramedics can perform FOCUS utilizing two different views.
Methods: A prospective study was performed in a suburban/urban setting with a population of 180,000 and 26,000 EMS calls annually. Twenty-seven fire-based paramedics were recruited for this study. The paramedics completed a 60-minute educational intervention on cardiac ultrasound. A 30-minute lecture followed by a hands-on practicum concentrated on using the parasternal long axis and subxiphoid views only. An emer-
gency medicine physician educated in basic ultrasound skills delivered the edu-
cational intervention to the paramedics. The paramedics were given a brief overview and training of ultrasound knobology, and then asked to perform FOCUS using only the parasternal long axis and subxiphoid views. Participants were then graded using the Car-
diac Ultrasound Assessment Scale (CUSAS). CUSAS is a 6-point graded scale that evaluates visualization of the cardiac structure. A CUSAS score of 6 is given when multiple chambers are visualized. A CUSAS score of 3 is given when there is only partial visualization of the ventricle. A CUSAS score of 1 is given when no chambers are visualized. Results: All 27 paramedics were able to view the heart during the practicum. When performing the parasternal long axis view 27 of 27 paramedics (100%) received a CUSAS score of 6 (multi-
ple chambers visualized). When performing the subxiphoid view 0 of 27 (0%) received a CUSAS score of 5 or 6, p < 0.001, 5 of 27 (19%) paramedics received a CUSAS score of 4 (multiple partial chambers visualized in the ven-
tricle) and 22 of 27 (81%) paramedics received a CUSAS score of 3. Conclusions: Our pilot study suggests paramedics with only limited education can be taught to perform a FOCUS using the parasternal long axis view, but have difficulty using the subxiphoid view.
of non-OHCA calls decreased over time (May 44%; Dec 29%). 11 patients survived to hospital discharge with a 10% survival rate; previously, the countywide survival rate was 10%. The countywide bystander CPR rate increased from 19% to 24%. Approximately 109 OHCA calls were for individuals at home. Work continues to increase the rate of OHCA calls transferred. Conclusions: Implementing a novel centralized dispatcher CPR program increased the rate of bystander CPR. Using a central communication center for instructions allowed us to train and maintain a smaller group of communicators, leading to less cost and improving accuracy of the communicators, while limiting the burden on the PSAP dispatchers.

169. Qualitative Study of Emergency Medical Technician and Patient Perspectives on the Transport Plus Program
Hayley Neher, Ksenia Gorbenko, Nadir Ian, Diana Giorgio, Hugh Chapin, Lynne Richardson, Ula Hwang, Kevin Munjal, Icahn School of Medicine at Mount Sinai Category of Submission: STUDENT, RESIDENT, FELLOW
Background: “Transport PLUS” is an educational intervention in which Emergency Medical Technicians (EMTs) are trained to use a checklist to perform discharge instruction comprehension assessments and home fall safety assessments for older adult patients transported home following hospitalizations. Previously reported preliminary findings demonstrated high rates of patient acceptance and removing fall hazards following the intervention. In this qualitative study, we endeavored to identify potential barriers to success and refine the existing checklist and other modifiable aspects of the program in order to maximize its effectiveness. Methods: This qualitative study consisted of two homogenous focus groups led by an experienced facilitator with Transport PLUS trained EMTs and potential older adult patients to assess barriers and opportunities for improving the program. Three independent analysts coded anonymous transcripts for themes, compared for reliability and disagreements were resolved through discussion. Results: Trained EMTs and potential patients found the program valuable but uncovered a number of potential barriers to success. Themes identified by both groups included concerns for patient privacy and the importance of obtaining buy-in from both patients and providers. Trained EMTs also suggested improving phrasing of items on the checklist and optimizing delivery of educational information. Patient focus group suggested ways to enhance comprehension. Suggested improvements included emphasis on situational awareness during EMT training, building rapport, question order, normalizing safety measures, and tailoring questions based on understanding and excluding specific items on the checklist. Conclusions: The Transport PLUS program was well received by both EMTs and patients. We found a high degree of agreement between the two groups in identified barriers to success. Adjustments in EMT training and support materials, including checklists and handouts, to address identified suggestions obtained during the focus group interviews. Training was specifically enhanced to emphasize quality assurance, fine motor skills and technique. Documents were enhanced to be more visually appealing, easier to understand, and promote better flow throughout the encounter. A recommendations list to assist with the effectiveness of the program is already underway. If successful, our program will reduce the burden of preventable injuries and readmissions on frontline providers and health care systems.

170. Am I awake? Lack of Sedation Protocols for Intubated Patients During Transport in Statewide Treatment Protocols
Christina Loporcaro, David Schoenfeld, Beth Israel Deaconess Medical Center/Harvard Medical School Category of Submission: STUDENT, RESIDENT, FELLOW
Background: In our constantly evolving healthcare system the transfer of intubated patients between facilities is an ever more common occurrence. We were interested in the literature regarding the impact of adequate sedation in the out of hospital environment, intensive care unit (ICU) studies have shown significant outcome measures such as ICU length of stay is associated with inadequate patient sedation. The purpose of this study was to describe current protocols for sedation of intubated patients during interfacility transfer (IFT), and the use of the standardized sedation assessment scoring to guide sedative medication administration. Methods: Retrospective chart review of STPs utilizing a standardized review to evaluate sedation protocols for intubated patients and the use of standardized sedation assessment scoring to guide sedative medication administration. Results: Thirty-one out of fifty states (62%) issue ALS STPs. Of those thirty-one states, only one (3%) has a protocol for sedation of intubated patients. No STP incorporates rates or references any sedation scoring tool to help guide sedative administration or aid in patient assessment. 75% of protocols have been revised since 2015 and all have been revised within the past 5 years. Conclusions: Although there is little in the prehospital literature regarding patient outcomes with respect to inadequate sedated patients, self-exhaustion, excessive agitation on hospital arrival and vital signs abnormalities are complications well known to providers. This study demonstrates that current STPs do not provide paramedics with the tools to optimally assess and sedate intubated patients in the out of hospital environment. While sedation plans may be developed with medical control prior to transfer, a protocolized approach to sedation scoring and medication administration may be beneficial. This represents a serious deficiency in our ability to provide high quality sedation to patients in the out of hospital environment. In the future, we hope to develop and validate a prehospital sedation scoring model and associated protocol for the management of intubated patients in the out of hospital environment.

171. Prevalence of Recurring Patient Encounters that Require Administration of Prehospital Naloxone: A Retrospective Chart Review
Thomas Dyksstra, Jen Knapp, Patrick Dugan, Rhees Nickel, City of Fort Wayne, EMS Foundation Chair Category of Submission: STUDENT, RESIDENT, FELLOW
Background: A significant proportion of patients responded to by EMS personnel for opioid overdose will continue to abuse opioids after treatment and resuscitation, leading to subsequent encounters that require additional treatment. The aim of this study is to identify the prevalence of recurring encounters that require the administration of Naloxone to reverse opioid abuse within the United States has continued to increase despite efforts to decrease their accessibility. To deter this issue, stricter guidelines regarding the use of naloxone in management of opioid abuse has led many individuals with addiction to seek illicit substances. The major health concern of opioid abuse, respiratory depressions is treated mainly with naloxone which counteracts opioids at the receptor level. It is thought by many EMS personnel that people experiencing resuscitation with naloxone will continue to abuse opioids. Methods: A retrospective chart review examined emergency patient care reports provided by the Three Rivers Ambulance Authority (TRAA). All encounters in which Naloxone was administered between November 1, 2010 and October 31, 2016 by TRAA or other bystanders were examined. The number of encounters each patient had during this data period was used to analyze a general recurrence rate of opioid use. Results: The increase in number of individuals experiencing more than one Naloxone related event annually did not differ significantly from what was expected over the 6-year range, \( x^2 = 9.81, p = 0.08 \). However, the number of patients falling into this category increased more than triple throughout the study. Conclusions: The results of this study suggest that the number of recurrent patient encounters involving the administration of Naloxone has increased. While the extent of the increase is not as large as was expected it is much less than initially believed by EMS personnel, additional future studies to correctly identify the impact of recurrent patient encounters may show significant results to assist combating addiction.

172. Pharmacologic Opioid Alternatives for Pain Control in Statewide Treatment Protocols
Christie Fritz, Christina Loporcaro, David Schoenfeld, Beth Israel Deaconess Medical Center/Harvard Medical School Category of Submission: STUDENT, RESIDENT, FELLOW
Background: There has been an increasing focus on reducing opioid use across healthcare in light of the opioid epidemic. There are multiple pharmacologic options for treating pain in the prehospital setting including ketamine, nitrous oxide, acetaminophen, ibuprofen, ketorolac and aspirin. The majority of states issue statewide treatment protocols (STPs) that are either mandatory, or serve as a guide for medical control. The purpose of this investigation is to describe the extent to which STPs include alternatives to opioids for pain control. Methods: Cross-sectional study of STPs utilizing a retrospective review of pharmacopeia in pain control protocols. Protocol revision date was also captured. Results: Thirty-two of fifty states (64%) issue STPs; 78% are mandatory; 38% of STPs limit pain management to opioid medications only; and 62% of STPs provide for pharmacologic alternatives to opioids for pain management. Pharmacologic alternatives for pain control are variable across STPs and include Nitrous oxide (50%), ketamine (19%), Tylenol (25%), ketorolac (25%), Ibuprofen (16%), and aspirin (6%). A total of 75% of protocols have been revised since 2015 and all have been revised within the past five years. All ALS statewide treatment protocols have explicit orders for opioids in their pain control protocols. Conclusions: The opiate epidemic in the U.S. has led to an increased focus on the use of alternatives to narcotic medications in healthcare. Pain management is an important part of prehospital care, however many states do not provide pharmacologic alternatives to narcotic medications. While no studies have linked prehospital narcotic administration as a cause of or contributor to the opiate epidemic, we should strive to reduce the use of narcotics when appropriate alternatives exist.
Background: Obesity is an epidemic in this nation and provides serious challenges to EMS systems. Many systems have identified the problem, but few provide a solution to their providers. Alternatively, EMS systems should create a solution that is deployable, cost-effective, and provides safe dignified transport. We describe the characteristics of a regional bariatric support unit (BSU) transport system dispatched via the 9-1-1 system for bariatric patients. Methods: Descriptive analysis of a regional BSU transport system in our region serving a population of over 1.2 million and transports approximately 114,000 cases/region according to its population. Regional recognition rate significantly varied from 10.0% to 88.1% (p < 0.01; averaged 77.4%, SD 14.9%). Compression rate varied from 45.2% to 88.4% (p < 0.01; averaged 75.3%, SD 12.8%). Average call-to-arrival time, call-to-instruction time, and call-to-compression time were evaluated. Each individual performance across the joint region. Conclusions: A regional BSU transport system provides a cost-effective, safe and dignified means of transport for bariatric patients during EMS response. While more than half of cases were dispatched ALS, the most common complaint was Extreme Pain. No patients used unconventional modes of transportation for transporting a patient to the hospital during this period. 20% of patients utilized the system. On-scene time significantly increased however no adverse events were reported.
with 33.3% for those on IV-ECMO (p = 0.35). In patients requiring ECLS, 50% survived to discharge; both had refractory VT/VF arrests. No difference in survival was noted based upon early (40%) versus late (50%, p = 0.70) ECMO initiation. Conclusions: In our patient cohort, ECMO was not associated with significant adverse event or mortality. VA ECMO for cardiopulmonary support was associated with worse final outcome. ECLS second- ary to VT/VF arrest was associated with better survival to discharge compared with other dysrhythmias. The current data suggest that transportation of ECMO patients is safe, and future works to ECMO need not be delayed pending transfer.

177. Does Prehospital Mode of Arrival Influence Women’s Decisions to Participate in Research?
Madeline Karafanda, Martina Anto-Ocrach, Vivian Lewis, Todd Jusko, Jeff Bazarian, Edwin van Wijngaarden, Courtney Jones, Department of Environmental Health, University of Rochester Medical Center Category or Submission: Medical

Background: Advances in medicine require volunteers in research. This requirement however, may compromise study generalizability, as it is often unclear how refusals and participants differ. Further complicating the matter is the National Institutes of Health (NIH) requirement, that proposed research studies address any possible disparities in gender. Investigators have explored the barriers and facilitators for research participation. Few, however, have focused on mode of arrival (ambulance vs non-ambulance) as a potential reason for gender disparities.

Methods: To explore how prehospital factors affect research participation, sampling female subjects only. We hypothesize that women more frequently refuse to participate in research (28.8% vs. 19.4%, p = 0.039). Ambulance use was associated with higher participation (41.6% vs. 14.1%, p < 0.001), were involved in Lab Activations from Prehospital ST-Elevation Criteria: Directly to the CT Scanner on ED Arrival? Bryan Sloane, Nichole Bossen, Jeffrey Saver, Nerses Sanossian, Marianne Gausche-Hill, Harbor-UCLA Medical Center Category or Submission: Medical

Background: To evaluate if a protocol to route EMS-transported stroke patients directly to the CT scanner on ED arrival reduces door-to-needle time (DTN). We hypothesized a reduced DTN compared to initial urgent cath to ED bed. Methods: This is a retrospective analysis from a large regionalized stroke system. EMS utilize the modified Los Angeles Prehospital Stroke Screen (mLAPSS) and transport all suspected acute stroke patients to any facility other than the nearest. Alerts were transported over the study period, with records available for 102 patients. Of patients identified as EMS STEMIs, 45.1% went to cath, and 36.3% received coronary intervention. Rates of cath lab activation and coronary intervention were significantly higher in patients with an ED physician interpretation of ST-elevation compared to those with LBBB (71% vs. 9%, OR 22.03, CI 9.77–49.68, p < 0.0001). One patient with LBBB received emergent cath with stenting after testing revealed elevated troponin. Secondary analysis of this patient’s EKG showed that he did not have Sgarbossa criteria. Conclusions: The majority of EMS STEMIs alerts did not require emergent catheterization. A total of 187 STEMIs alerts were due to nondiagnostic EKGs rather than LBBB. It appears that removal of LBBB alerts as a criteria for STEMIs activation can safely lower STEMIs alert numbers. Future protocols will direct EMS to transport patients with LBBB and anginal symptoms to a PCI-capable center without designation the patient as an STEMIs alert. Further efforts will be aimed at decreasing the number of false positive alerts through EMS education.

180. Is Door-to-needle Time Reduced for EMS Transported Stroke Patients Routed Directly to the CT Scanner on ED Arrival? Bryan Sloane, Nichole Bossen, Jeffrey Saver, Nerses Sanossian, Marianne Gausche-Hill, Harbor-UCLA Medical Center Category or Submission: Medical

Background: To evaluate if a protocol to route EMS-transported stroke patients directly to the CT scanner on ED arrival reduces door-to-needle time (DTN). We hypothesized a reduced DTN compared to initial urgent cath to ED bed. Methods: This is a retrospective analysis from a large regionalized stroke system. EMS utilize the modified Los Angeles Prehospital Stroke Screen (mLAPSS) and transport all suspected acute stroke patients to any facility other than the nearest. Alerts were transported over the study period, with records available for 102 patients. Of patients identified as EMS STEMIs, 45.1% went to cath, and 36.3% received coronary intervention. Rates of cath lab activation and coronary intervention were significantly higher in patients with an ED physician interpretation of ST-elevation compared to those with LBBB (71% vs. 9%, OR 22.03, CI 9.77–49.68, p < 0.0001). One patient with LBBB received emergent cath with stenting after testing revealed elevated troponin. Secondary analysis of this patient’s EKG showed that he did not have Sgarbossa criteria. Conclusions: The majority of EMS STEMIs alerts did not require emergent catheterization. A total of 187 STEMIs alerts were due to nondiagnostic EKGs rather than LBBB. It appears that removal of LBBB alerts as a criteria for STEMIs activation can safely lower STEMIs alert numbers. Future protocols will direct EMS to transport patients with LBBB and anginal symptoms to a PCI-capable center without designation the patient as an STEMIs alert. Further efforts will be aimed at decreasing the number of false positive alerts through EMS education.
cation occurred respectively in 63% and 96% in the CT routing group and 66% and 86% in the ED routing group. DTN was not different between groups, median DTN 59 minutes (IQR 45–78) for CT routing and 54 (IQR 40–73) for ED routing, median difference 4.5 (80% CI, 1.9–7.1). There were no differences between the groups in terms of secondary outcomes or within the mLAPSS-positive subgroup.

Conclusions: In this regional stroke system, hospital routing had a significant effect on patient outcomes. The influence of standardizing hospital routing on improving outcomes warrants further investigation.

181. Withdrawn

182. Association between BMI and Priority of Advanced Airway in Out-of-Hospital Cardiac Arrest

Caitlin Howard, David Wampler, Jeremy Allen, Hattie McAviney, Justin Smith, David Miramontes, Joa Polk, United States Army and UTHSCSA CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Obesity is associated with diffi-

cult prehospital endotracheal intubation. The objective of this study was to examine the associa-
tion between patient BMI and the selection of advanced airway by prehospital providers during out-of-hospital cardiac arrest (OHCA).

Methods: This was a retrospective review of an in-house cardiac arrest registry containing details of each resuscitation attempted by a large urban fire-based EMS system. Advanced airway selection was at the discretion of the resuscitation team. The BMI recorded was a subjective measurement obtained from the paramedic at the time of data collection. Data was analyzed from January 1, 2016 through August 15, 2016. Patients were included in the study if the following variables were available: age, gender, BMI, and initial airway attempted (supraglottic vs ETT). Patients were excluded if age < 17, no age, gender, or BMI recorded, or an airway other than supraglottic or ETT was selected. The BMI was divided into 4 groups based on the BMI (under, normal, over, morbid). A subcategory analysis of endotracheal intubation method (direct laryngoscopy (DL) vs. video laryngoscopy (VL)) was also examined. ANOVA was utilized to analyze continuous variables and a \( \chi^2 \) test was used to analyze categorical variables.

Results: A total of 471 patients were included. Mean age for the population was 63.56 + 17.65 years with 293 males (61.8%). Most patients were classified as normal BMI (209 patients, 44.09%) or an airway other than supraglottic or ETT (209 patients, 44.09%). A subcategory analysis of endotracheal intubation method (direct laryngoscopy (DL) vs. video laryngoscopy (VL)) was also examined. ANOVA was utilized to analyze continuous variables and a \( \chi^2 \) test was used to analyze categorical variables.

Conclusions: Obesity is associated with difficult prehospital endotracheal intubation. This is the first study to examine the association between patient BMI and the selection of advanced airway by prehospital providers during out-of-hospital cardiac arrest (OHCA). Further research is needed to elucidate the role of BMI in determining airway selection in OHCA.

183. Development of Modified Trauma and Injury Severity Score Model to Predict Disability for Acute Trauma Patients

Kim Jeong Hong, Sang Do Shin, Kyungwon Jun Song, Young Sun Ro, So Yeon Kong, Tae Han

Background: Trauma and Injury Severity Score (TRISS) has been used to predict mortality of trauma patients, but it is difficult to perform qualitative improvement of trauma care system. In advanced countries, functional outcome including disability is recently emphasized as a quality indicator for trauma care system. The goal of this investigation is to develop modified model of Trauma Related Injury Severity Score to predict disability for acute trauma patients.

Methods: We used emergency medical services database and trauma registry database of the Korea Centers for Disease Control. We enrolled severe trauma cases transported by fire department from January to December 2013 in 10 provinces across Korea. We calculated revised trauma score (RTS) and injury severity score (ISS) for enrolled cases. We developed modified TRISS model predicting severe disability and worsening disability using age index (0–14, 15–54, 55– years), RTS and ISS. TRISS-D model for severe disability was developed as blunt or penetrating injury. TRISS-B model 2 added presence of severe head injury when abbreviated injury scale (AIS) of head was 3 or more. We assessed discriminative power of each model by Area Under the ROC Curve (AUC) value. Results: A total of 14,791 patients were enrolled. 5,757 cases were severe disability and functional outcome was assessed discriminative power of each model by Area Under the ROC Curve (AUC) value.

Conclusions: Different between groups, median DTN 59 minutes in the ED routing group. DTN was not different between groups, median DTN 59 minutes (IQR 45–78) for CT routing and 54 (IQR 40–73) for ED routing, median difference 4.5 (80% CI, 1.9–7.1). There were no differences between the groups in terms of secondary outcomes or within the mLAPSS-positive subgroup.

Conclusions: In this regional stroke system, hospital routing had a significant effect on patient outcomes. The influence of standardizing hospital routing on improving outcomes warrants further investigation.

181. Withdrawn

182. Association between BMI and Priority of Advanced Airway in Out-of-Hospital Cardiac Arrest

Caitlin Howard, David Wampler, Jeremy Allen, Hattie McAviney, Justin Smith, David Miramontes, Joa Polk, United States Army and UTHSCSA CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Obesity is associated with diffi-

cult prehospital endotracheal intubation. The objective of this study was to examine the associa-
tion between patient BMI and the selection of advanced airway by prehospital providers during out-of-hospital cardiac arrest (OHCA).

Methods: This was a retrospective review of an in-house cardiac arrest registry containing details of each resuscitation attempted by a large urban fire-based EMS system. Advanced airway selection was at the discretion of the resuscitation team. The BMI recorded was a subjective measurement obtained from the paramedic at the time of data collection. Data was analyzed from January 1, 2016 through August 15, 2016. Patients were included in the study if the following variables were available: age, gender, BMI, and initial airway attempted (supraglottic vs ETT). Patients were excluded if age < 17, no age, gender, or BMI recorded, or an airway other than supraglottic or ETT was selected. The BMI was divided into 4 groups based on the BMI (under, normal, over, morbid). A subcategory analysis of endotracheal intubation method (direct laryngoscopy (DL) vs. video laryngoscopy (VL)) was also examined. ANOVA was utilized to analyze continuous variables and a \( \chi^2 \) test was used to analyze categorical variables.

Results: A total of 471 patients were included. Mean age for the population was 63.56 + 17.65 years with 293 males (61.8%). Most patients were classified as normal BMI (209 patients, 44.09%) or an airway other than supraglottic or ETT (209 patients, 44.09%). A subcategory analysis of endotracheal intubation method (direct laryngoscopy (DL) vs. video laryngoscopy (VL)) was also examined. ANOVA was utilized to analyze continuous variables and a \( \chi^2 \) test was used to analyze categorical variables.

Conclusions: Obesity is associated with difficult prehospital endotracheal intubation. This is the first study to examine the association between patient BMI and the selection of advanced airway by prehospital providers during out-of-hospital cardiac arrest (OHCA). Further research is needed to elucidate the role of BMI in determining airway selection in OHCA.
correlated with transport frequency independently. GCD and CTAS score may be quite useful predictors of poor survival in Cardiac arrest cases, with very high scores suggesting a very low likelihood of ROSC even when selecting patients who can be managed on-site without transport to hospital.

186. Early Double Sequence Defibrillation Improves Outcomes in Refractory Ventricular Fibrillation

Matthew Harris, Ronald Klebacher, Joshua Schwarzbaum, Andrew Parrish, Michael Carr, Andrew Torres, Nuvin Artyaprakai, Amunped Tagagting, Eric Baum Ehr, Bauter Robert Mark Merlin, Newark Beth Israel Medical Center Categorie of Submission: Cardiac

Background: Refractory ventricular fibrillation (RVF) has been defined as VF that persists after 5 standard attempts at defibrillation (SD), though no uniform definition exists. Its incidence has been estimated at 0.5–0.6 per 100,000 population. Double sequence defibrillation (DSD) has emerged as a possible treatment for RVF. Two rapid sequence defibrillations at 360 J were placed on the patients with RVF. After 3 SDs, 2 sets of defibrillation pads were placed on the patients with RVF. Two rapid sequence defibrillations at 360 Joules were delivered. No limit was placed on the number of DSD shocks provided. We compared patients who received DSD to those who received SD. Our primary outcome was ROSC. We performed descriptive statistics, and association between variables with ANOVA and Chi-squared. Results: We identified 280 patients with RVF, 229 (82%) received SD only and 51 (18%) received DSD. Comparing the SD group vs. DSD group: Mean Age 57.7 ± 18.0 vs. 57.2 ± 17.9 (p < 0.001), Male gender 76.2% vs. 72.5% (p < 0.001), and mean weight (kg) 89.3 vs. 90.1 (p < 0.001). There were fewer witnessed arrests in the control group (61.6% vs. 80.4%). Time to 1st shock was the identical (14.7 min ± 9.5 vs. 14.7 min ± 10.1), and in those who received DSD, mean time to first DSD was 33.6 minutes. The rate of ROSC was higher in the control arm compared to therapy arm, though this was not statistically significant (31.4% vs. 23.5%) (p value = 0.26). Of the 32/51 patients with ROSC in DSD arm, average time to 1st DSD was 13.7 ± 7.6 vs. 35.5 (p < 0.001). These patients had similar numbers of primary shocks (4.42 vs. 4.78) but required fewer DSD (2.8 vs. 5.47). Conclusions: The management of RVF remains challenging. While the achievement of ROSC was higher in the non-DSD group, the difference did not meet statistical significance. Those who received DSD earlier had higher rate of ROSC than those with more delay, and required fewer DSD attempts.

187. Prehospital Online Medical Oversight (Promo) An Analysis of the Interaction between Emergency Room Physicians and Paramedics

Jason Pпрі, Alicia Violin, Sylvie Michaud, Nicole Sykes, Paul Myre, Health Sciences North Centre for Prehospital Care Category of Submission: Operations, Quality, Safety, Systems, Disaster

Background: In Ontario, paramedics operate mainly under off-line medical direction, they use online medical control when it is mandatory according to provincial medical directives or if a patient’s condition that do not fit into their protocols. Literature that encompasses the interaction that occurs between overnight physicians and paramedics is limited even though this interaction is critical to ensure patients receive appropriate prehospital care. Objective: The objective was to describe the qualitative outcomes of a Ontarian EMT and a Canadian EMS system and use the study findings to develop a quality improvement program which will enhance the outcome of online medical control. Methods: Inclusion of written and audio records of online medical control interactions from April 1, 2016 to March 31, 2017. Audio recordings were assessed by a single reviewer following predetermined criteria which gauged the efficiency of communication that occurred during each interaction. Results: There were 454 online interactions in the fiscal year, of which 338 were audio as audio was unavailable and 27 could not be retrieved due to technology failure at the dispatch level. Therefore 413 cases were assessed. Three hundred thirty-eight patients (81.8%) were mandatory provincial patch points with 289 (85.5%) regarding patients in cardiac arrest. Analysis administration made up 30.7% of the non-mandatory calls, and all resulted in medical orders. In 100% of patches additional information was requested by the physician in 151 (31.7%) patches no request was made by the paramedic. The average length of patch was 0:02:03 (SD = 0:01:07) and the paramedic had to wait on average 0:01:11 (SD = 0:00:44) before talking to an online physician. Conclusions: Implementing standardization of information handover will allow for patch calls to be more efficient and ensure all pivotal information is communicated. This will allow overnight physicians to make informed clinical decisions optimizing the care provided to patients. To further enhance the medical control provided by overnight physicians it would be beneficial to determine the most effective way to provide EMS training to these physicians. Also, as all requests for analgesia were granted, implementing a medical directive with increased paramedic autonomy for pain control would be warranted.

188. Quantifying EMS Resource Allocation for Pediatric Transports

Jennifer Anders, Jennifer Fishe, Kevin Pooter, Carla Tilchin, Kyle Fratta, Johns Hopkins University School of Medicine Category of Submission: Pediatric

Background: Regionalization of pediatric care decreases available pediatric services at community hospitals; however, some children should bypass closer hospitals for direct transport to pediatric specialty facilities. Future tools assisting EMS with transport destination choices must balance EMS resource allocation with direct transport’s benefits. To do so, the current burden of pediatric transport on EMS agencies must be quantified to provide a benchmark for future systems changes. Objective: The objective of this study was to describe the baseline EMS services utilization for pediatric transport in three geographically diverse jurisdictions (urban, suburban, and rural). Methods: This study examined a 12-month retrospective cohort of pediatric (0–17 years) EMS transports from three Maryland counties. Agencies use the same patient care protocols, EMT, and Heli-copter EMS (HEMS) system. Each patient transport location, actual transport times, demographics, and clinical variables were abstracted from the EMT and HEMS direct destination hospital locations were geocoded to calculate road driving distance. Each agency’s baseline EMS utilization and predicted transport was then estimated using transport miles and minutes. Results: The three counties transported a total of 12,223 pediatric patients during the 12-month period. In the suburban area, transports per year = 5,987, and rural n = 243). Total EMS utilization for pediatric transport was 63,631 minutes and 27,613 miles in the urban jurisdiction; 91,002 minutes and 77,831 miles in the suburban jurisdiction and 7,605 miles in the rural jurisdiction. Conclusion: EMS resource for pediatric transport was zero in the urban county, 0.1% in the suburban county and 4.8% in the rural county (p < 0.001). Mean transport time per patient varied significantly at 10.6, 15.2 and 21.6 minutes, respectively (p < 0.001). Mean road transport miles per patient was 4.6, 13.0, and 31.3 respectively (p < 0.001). On a population basis, EMS utilization for pediatric transport was 0.493, 0.494, and 0.445 per pediatric citizen and 0.214, 0.171, or 0.138 road miles per citizen per year, respectively (p < 0.001). Conclusions: EMS resource use for pediatric transports is noteworthy and varies significantly between urban, suburban, and rural jurisdictions. This study provides essential benchmarks for future development of pediatric direct transport protocols.

189. Assessment of Emergency Medical Services Provider Research Literacy and Involvement

Lauren Maloney, Robert Marshall, Henry Thiele Jr, Adam Singer, Stony Brook University Department of Emergency Medicine Category of Submission: Student, Resident, Fellow

Background: For a needs assessment for future continuing medical education classes and rollout of prehospital clinical research, a survey was developed to gather data on provider attitudes towards evidence-based medicine (EBM), participating in clinical research, and informed consent. Methods: A 35 question survey was distributed to 71 employees of a university-based EMS system. Surveys included demographic and experience items. Responses to various statements were graded for Pediatric Transports.

Jennifer Anders, Jennifer Fishe, Kevin Pooter, Carla Tilchin, Kyle Fratta, Johns Hopkins University School of Medicine Category of Submission: Pediatric

Background: Regionalization of pediatric care decreases available pediatric services at community hospitals; however, some children should bypass closer hospitals for direct transport to pediatric specialty facilities. Future tools assisting EMS with transport destination choices must balance EMS resource allocation with direct transport’s benefits. To do so, the current burden of pediatric transport on EMS agencies must be quantified to provide a benchmark for future systems changes. Objective: The objective of this study was to describe the baseline EMS services utilization for pediatric transport in three geographically diverse jurisdictions (urban, suburban, and rural). Methods: This study examined a 12-month retrospective cohort of pediatric (0–17 years) EMS transports from three Maryland counties. Agencies use the same patient care protocols, EMT, and Heli-copter EMS (HEMS) system. Each patient transport location, actual transport times, demographics, and clinical variables were abstracted from the EMT and HEMS direct destination hospital locations were geocoded to calculate road driving distance. Each agency’s baseline EMS utilization and predicted transport was then estimated using transport miles and minutes. Results: The three counties transported a total of 12,223 pediatric patients during the 12-month period. In the suburban area, transports per year = 5,987, and rural n = 243). Total EMS utilization for pediatric transport was 63,631 minutes and 27,613 miles in the urban jurisdiction; 91,002 minutes and 77,831 miles in the suburban jurisdiction and 7,605 miles in the rural jurisdiction. Conclusion: EMS resource for pediatric transport was zero in the urban county, 0.1% in the suburban county and 4.8% in the rural county (p < 0.001). Mean transport time per patient varied significantly at 10.6, 15.2 and 21.6 minutes, respectively (p < 0.001). Mean road transport miles per patient was 4.6, 13.0, and 31.3 respectively (p < 0.001). On a population basis, EMS utilization for pediatric transport was 0.493, 0.494, and 0.445 per pediatric citizen and 0.214, 0.171, or 0.138 road miles per citizen per year, respectively (p < 0.001). Conclusions: EMS resource use for pediatric transports is noteworthy and varies significantly between urban, suburban, and rural jurisdictions. This study provides essential benchmarks for future development of pediatric direct transport protocols.
190. CAN HEART RATE VARIABILITY RISK STRATIFY PATIENTS WITH UNDIFFERENTIATED NON-TRAUMATIC CHEST PAIN?

Juan March, Carmon Rساسسنيهلاو, Nicholas Murray, Beth Israel Deaconess Medical Center/Harvard Medical School Category of Submission: CARDIAC

Background: Previous research suggests that heart rate variability (HRV), also known as R to R variability, can be used to risk stratify patients with known acute coronary syndromes. The HRV spectrum contains two major components. One component of HRV is the high frequency (0.18–0.4 Hz) component, which is synchronous with respiratory sinus arrhythmia. The second is a low frequency (0.04–0.15 Hz) component that appears to be mediated by both the vagus and cardiac sympathetic nerves. This study examined whether heart rate variability can be used to risk stratify patients presenting with undifferentiated non-traumatic chest pain.

Methods: This exploratory study was performed at a percutaneous coronary intervention capable tertiary teaching hospital with 900 beds and an Emergency Department (ED) with an annual census of >50,000. A convenience sample of adult patients presenting to the Emergency Department with a chief complaint of non-traumatic chest pain were enrolled. HRV was captured using a phasic status monitor affixed to the chest for a 5–10 minute period during the patient’s ED stay. High risk patients were identified by either a positive troponin, positive stress test, ST elevation on EKG, or death within 30 days. A low frequency/high frequency ratio of less than 1.0 was used as the cutoff. Data analysis was performed with a Fischer Exact test. Results: A total of 26 patients were enrolled. All six patients identified as high risk had a LF/HF ratio of less than 1.0; sensitivity = 100%. Furthermore, all 20 patients who were determined to be low risk had an HF/LF ratio > 1.0; specificity = 100%, p = 0.0001. Conclusions: This pilot study suggests that heart rate variability with a LF/HF ratio < 1.0 may be used to rapidly risk stratify patients with undifferentiated non-traumatic chest pain.

191. CORRELATION OF EGG-BASED BRAIN RESUSCITATION INDEX AND END TIDAL CO2 IN PORCINE CARDIAC ARREST MODEL

Dongsun Choi, Hee Jin Kim, Taehan Kim, Ki Jeong Hong, Young Sun Ro, Kyung Jun Song, Hee Chan Kim, Shin Sang Do, Seoul National University Hospital, Department of Emergency Medicine Category of Submission: CARDIAC

Background: Evaluation of brain death is important during resuscitation of cardiac arrest. We developed non-invasive EGG-based brain resuscitation index (EBRI) and evaluated correlation EBRI and end-tidal CO2 (ETCO2). Methods: A crossover animal experimental study using porcine cardiac arrest model was designed. After 1 minute of untreated ventricular fibrillation, alternating low quality CPR (compression depth 5 cm and compression rate 100/min) and low quality CPR (compression depth 3 cm and compression rate 60/min) was performed. Then EBRI was calculated using the patient's EGG channel which has the lowest noise. Mixed model analysis was conducted to compare the differences of hemodynamic parameters, ETCO2 and EBRI between high quality CPR period and low quality CPR period. Pearson's correlation was calculated to assess correlation between EBRI and ETCO2. Results: Experiment was performed in five female porcine (44.6 ± 2.8kg). EBRi and ETCO2 was calculated on quality of CPR received. Delta EBRI obtained during high quality CPR was significantly higher than delta EBRI of lower quality CPR (HQC: Median 0.17, (0.04–0.30) (ETCO2: (0.05–0.32) p = 0.01). EBRI had statistically moderate positive correlation with ETCO2 (r = 0.56). Conclusions: In porcine cardiac arrest model, EEG-based Brain Resuscitation Index was significantly obtained during resuscitation and had statistically moderate correlation with ETCO2.

192. SOCIAL CONNECTEDNESS AND COPING STYLES IN EMS WORKERS AND THEIR ASSOCIATION WITH BURNOUT AND PERCEIVED STRESS

Lori Boland, Pamela Mink, Jonathan Kamrud, Jessica Jerald, Charles Lick, Andrew Stevens, Alius Health Emergency Medical Services Category of Submission: PROFESSIONAL

Background: To assess social connectedness and coping styles among emergency medical services (EMS) providers and explore their association with occupational burnout and perceived stress. Methods: A 167-item electronic survey was distributed to employees of a large ambulance service that provides 9-1-1 response in Minnesota. The survey included the Maslach Burnout Inventory (MBI), Cohen’s 4-item Perceived Stress Scale (PSS), the Brief COPE Inventory, and the Berkman-Syme Social Network Index (SNI). Burnout was defined as a high score on the emotional exhaustion (≥27) or depersonalization (≥13) subscales of the MBI. The COPE inventory assesses an individual’s tendency to use 14 coping styles in response to stressful situations, with scores ranging from 2 (low use) to 8 (high use). Results: Responses were received from 217 providers (54% response); the mean age was 40, 60% were male, and 55% had an EMS tenure of 5 years. The prevalence of burnout was 18% (24%), and the prevalence of burnout in each category of burnout was: severe (15%), moderately isolated (33%), moderately involved (15%), and socially integrated (15%). The prevalence of burnout was significantly associated with increased mean PSS score: socially integrated (OR = 1.3–2.5, p = 0.0001), Magnesium Sulfate from 12.5% to 19.9% (p = 0.009) & 1:1000 Epinephrine from 3.2% to 6.8% (p = 0.03). Conclusions: Higher scores on the coping subscales of seeking social support, and use of instrumental support to cope were associated with a decrease of the rate of cardiac arrest after EMS contact for medical patients in the system from 12% to 9.1% (NS). The implementation of the bundle of care addressing key interventions for patients presenting with respiratory distress patients. Patient care bundles may have significant utility to improve patient care and safety in the prehospital setting.

193. IMPACT OF THE IMPLEMENTATION OF A CRITICALLY ILL PATIENT BUNDLE OF CARE ON THE PERFORMANCE OF KEY INTERVENTIONS FOR RESPIRATORY DISTRESS PATIENTS BY PARAMEDICS IN THE FIELD

Mark Pinchalk, Mark Tomassi, Roth Ronald, Jeffery Reim Jr., James Dluto, Simon Taxel, Thomas Goode, City of Pittsburgh EMS Category of Submission: PROFESSIONAL

Background: Medical intervention patient care bundles have been advocated as a process based system to improve patient care and outcomes using evidence based guidelines. We sought to evaluate the effect of the implementation of a Prehospital “Crashing Patient” Critical Care Bundle on the performance of key prehospital intervention for patients presenting with respiratory distress. Methods: A “Crashing Patient” bundle of care addressing key interventions for critically ill patients was implemented in an urban Advanced Life Support (ALS) EMS system from 2012–2014. After full implementation of the care bundle, retrospective Patient Care Report (PCR) review was conducted of PCRs with a chief complaint of “Respiratory Distress” for the first calendar quarter after implementation and compared to PCRs for the most recent quarter (April–June 2017). Results: There were 905 respiratory distress PCRs in the 2014 interval and 885 in 2017. In 2017 there were improvements in EKG & end tidal carbon dioxide (ETCO2), vascular access and CPAP application, compared to respiratory distress cases. For the subset of patients who received Albuterol for bronchospasm, the rates of administration of Methylprednisolone, Magnesium Sulfate and 1:1000 Epinephrine were compared between the two time intervals. Results: There were 905 respiratory distress PCRs in the 2014 interval and 885 in 2017. In 2017 there were improvements in EKG & end tidal carbon dioxide (ETCO2), vascular access and CPAP application, compared to 2014. Conclusions: The implementation of the bundle of care addressed key interventions for critically ill patients. The implementation of “crashing” patient bundle of care resulted in a significant performance improvements in accomplishing key interventions for respiratory distress patients. Patient care bundles may have significant utility to improve patient care and safety in the prehospital setting.

194. TRACKING VIOLATIONS OF NEWLY IMPLEMENTED BEHAVIORAL EMERGENCY TREATMENT PROTOCOL

Timothy Lynch, Christie Fritz, David Schoenfeld, Beth Israel Deaconess Medical Center/Harvard Medical School Category of Submission: STUDENT, FELLOWSHIP, FELLOW

Background: In September 2014, Massachusetts state law added three EMS protocols which authorized the use of haloperidol and/or a benzodiazepine for management of behavioral emergencies. The newly adopted protocol allows for medication administration with contractual agreement and with respect to any history of seizures, or prolonged QT interval. Geriatric dosing was reduced by 50%. The new protocol was implemented following a standard training module. The objective of this evaluation is to describe the frequency and type of protocol violations observed during the implementation of a new protocol, with the goal of help-
ing to better understand the types of errors, so as to improve implementation of future treat-
ments. We sought to identify what further training if any is needed and plan for future protocol roll out difficulties. Meth-
ods: Retrospective chart review of calls occurring in a 12-month period (October 1, 2014 to September 30, 2015) in which the new behavioral emergencies pro-
tocol was utilized. Cases were reviewed for protocol violations and the type of violation was recorded. Results: There were a total of 56 calls during the study period that utilized the new behavioral emergencies protocol including the administration of haloperidol. Prot-
ocol violations occurred in 26% (95% CI 18–42%) of cases. The most common error was protocol violations at 17% (95% CI 9–26%), with 13% (95% CI 6–24%) having a seizure history of or reported pediatric administrations. 9% (95% CI 4–20%) of haloperidol administrations were not reduced for geriatric use. While not required by the pro-
tocol, OLMC was contacted in 14% (95% CI 7–
27%). Conclusions: Standard Treatment Protocols allow for rapid implementation of care by prehospital providers, without the need to con-
tact OLMC. This study sheds light on the type and frequency of errors observed when adopting a new protocol and this analysis can provide use-
ful insight to help better tailor training for new protocol implementation. Additionally, unne-
ceessary calls to OLMC were observed, suggest-
ing a lack of familiarity or confidence with the new protocol. This investigation demonstrates potential problems in new protocol implementation and we recommend further study to develop best practices for training and implementation of new clinical protocols.

195. EMERGENCY PHYSICIAN TELEHEALTH
DISPOSITIONS OF LOW-ACTIVITY 9-1-1 PATIENTS
Michael Gonzalez, David Persse, Guy Gieles-
berg, Karen DuPont, Andrew Kincannon,
Houston Fire Department CATEGORY OF SUBMIS-
SION: MEDICAL

Background: Every day within the United States low-acuity patients are transported to emergency departments (ED) for primary care. American College of Emergency Physicians and National Association of EMS Physicians believe that not all patients require ALS care and in these circumstances, alternate transport and desti-
nation may be appropriate. EMS patient dis-
posals are directly determined by the pre-
medic assessment along with off-line medical direction. At present, literature regarding pre-
hospital physician telehealth patient disposi-
tions are limited. The aim of this study was to measure and report prehospital Emergency Telehealth and Navigation (ETHAN) mobile-integrated patient dispositions for alternate transportation and/or destination. Methods: This retrospective study was conducted on con-
secutive EMS patients triaged by telehealth emergency physicians in a major metropolita-
n urban fire-based EMS system from December 2014 through May 2017. Once on scene, EMS completes a patient assessment together with ETHAN inclusion/exclusion criteria. If eligible, the medics transfer the ePCR and contacts the Physician, who interviews the patient via real-time video/voice conferenc-
ing and determines the appropriate dispositions. Further, the ETHAN protocol was employed from the ePCR system. Descriptive statistics describe study findings. A 95% confidence interval was calculated for telehealth disposi-
tions. Results: During the study period 10,042 patients met the ETHAN criteria. Among this group of patients, 28% were transported to an alternate transport and/or destination 77% (95% CI 76–78%) (5942/Referred to ED by ETHAN MD-Cab or

197. REVIEW OF EMERGENCY MEDICAL SERVICES (EMS) TRANSPORTS TO A FREESTANDING EMERGENCY DEPARTMENT (FSED)
Matthew Chinn, Brittany Farrell, M. Riccardo
colella, Medical College of Wisconsin CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS, DISASTER

Background: Freestanding emergency depart-
ments (FSED) are an area of expansion in healthcare. Despite rapid growth, there is a min-
imal amount of literature regarding the appropri-
ateness of usage of patients transported to freestanding emergency medical services (EMS) providers. Purpose: The study seeks to review and develop a list of objective markers for improving EMS field triage to a FSED through evidence-based recommendations. Methods: Patient data was retrospectively reviewed from the EPIC elec-
tronic medical record system of all patients brought in to a single FSED by ambulance dur-
ing a six month convenience period. A report was generated to abstract patient demographic,
medical information, and disposition. Nusing data fields were then manually entered. Ambulance services were all previously given a list of FSED capabilities and guidance on by whom and for major transport. EMS and stroke,
care, amongst others, in accordance with best
practice guidelines upon facility opening. Data was analyzed using an unpaired t-test.
Results: There were 138 patients transported to a single FSED during the six month period of September 2016–February 2017 by 12 ambulance services. A total of 105 patients were discharged home directly from the FSED and 20 received transport to a full-
service hospital for admission or specialty care; 7 were admitted to a psychiatric facility; 6 were admitted to a skilled nursing facility. There was a statistically significant difference between patients discharged home and those transferred to a full-service hospital (52.69 years vs. 71.75 years; p = 0.001). There was no statisti-
cally significant difference between these two groups in initial FSED pulse rate, respiratory rate, systolic blood pressure, or temperature. There was a trend towards a longer length of stay in the FSED for patients transferred to a full-service hospital (183.51 min vs. 236.25min; p = 0.0865).
Conclusions: The data reflects that older patients are more likely to require transfer and possibly admission after initial treatment at a FSED. The FSED initial vitals were not good predictors of the need for transfer; the use of initial vitals as a surrogate for prehospital vitals is a limitation. Further research is needed to evaluate other possible indicators that may be used to triage patients to the most appropriate emer-
gency department.

198. VARIABILITY OF CALIFORNIA LOCAL EMS SERVICES WITH THEIR CORRESPONDING LEVEL OF EVIDENCE
Jennifer Farah, J. Joelle Donofrio, Nicholas
Aldridge, University of California, San Diego CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: We sought to compare Califor-
nia local EMS agencies’ (LEMSA) protocols and review evidence-based guidelines on the treatment of three main pediatric respiratory complaints by presentation: asthma (wheez-
ing), bronchiolitis (wheezing < 24 months), and croup (stridor). Methods: Available available protocols from 33 California LEMSA were itemized and reviewed in the following categories: wheezing, wheezing < 24 months, and croup. Descriptive statistics were used to compare these protocols. Literature reviews, including the American Academy of Pedi-
atricts (AAP) current treatment guidelines, were used to create level of evidence (LOE)
tables for asthma, bronchiolitis, and croup. Of note, steroids were included only in the literature; however, some LEMSAs do not currently use steroids prehospital. The evidence-based tables were compared to California local EMS agency protocols. Results: Among the 33 LEMSAs, the most common treatments included albuterol (33/33) and IV/IM epinephrine (33/33), having >2 LEMSAs. The most common treatments included albuterol (33/33) and IV/IM epinephrine (33/33). The least common treatments included nebulized epinephrine and magnesium. However, evidence strongly supports the use of albuterol, ipratropium, epinephrine, magnesium, steroids, and noninvasive positive pressure ventilation (NIPPV) in the asthmatic child. Only three agencies differentiated wheezing in children <1 year of age, referencing this as possible bronchiolitis. All three included albuterol and NIPPV as their recommended treatments but did not include nebulized hypertonic saline, nebulized epinephrine, steroids or suctioning. For children <24 months, albuterol and steroids are not recommended based on new AAP guidelines. Stridor had the highest protocol variability, with no treatment having uniform use among agencies. The most common treatments included IV/IM epinephrine (24/33), NIPPV (29/33), and humidified mist (18/33). The least common treatments were nebulized epinephrine (12/33) and suctioning (4/33). For stridor, evidence supports the efficacy of all formulations of epinephrine. Conclusions: There is wide variation among California LEMSAs in their management of pediatric respiratory disease. Changes in treatments guidelines have likely created the discordance between current treatment practices and LOE tables. Timely evidence-based updates will likely benefit prehospital agencies’ treatment protocols.

199. EARLY IMPACT OF AN EMERGING MIH PROGRAM FOR 9-11 HIGH UTILIZERS Jon Ehrenfeld, Ashley Clayton, Catherine Counts, Michael Sayre, Seattle Fire Department Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Vulnerable, medically complex patients comprise a disproportionate share of resuscitation, fire-based EMS systems. A social worker-based Mobile Integrated Healthcare (MIH) program was designed to intervene using either direct engagement (DE) or indirect care coordination (CC). We hypothesized that sustained outreach would reduce 9-1-1 activations and engage more appropriate services. Methods: We used computer-aided dispatch and electronic health records to identify housed individuals with ≥3 EMS responses in the previous quarter. The social worker then assigned enrolees to the DE or CC cohort based on previous call volume, current services, vulnerability, and case management history. We recorded medical and social services in place, existing case managers or providers, services and referrals initiated, ongoing 9-1-1 utilization, and reason for disenrollment when applicable. Groups were compared by chi-squared and t-tests. Results: Baseline quarterly EMS responded 389 times to 45 patients. Twenty-eight were female, the median age was 64 (IQR 56–71), 29 were Caucasian, and 12 were African American. All were medically and socially complex, with a mean of >4 medical or social comorbidities per patient. Nineteen were assigned to DE and 26 to CC. In the first quarter the cohorts had a similar number of responses (DE 9.5 ± 7.2, CC 8.4 ± 4.7, p = 0.54). More patients in the DE cohort received medical intervention (37% vs. 8%, p = 0.02) and primary care linkage (53% vs. 15%, p = 0.008), while case management staffing alone was more prevalent in the CC cohort (77% vs. 47%, p = 0.041). Quarterly EMS responses declined to 6 ± 5.7 after 3 months, 6.4 ± 6.6 after 6 months, and 3.9 ± 4.5 after 9 months of enrollment. Clients in the third quarter averaged a six-call decrease compared to baseline (1.8–10.2, p = 0.011). Nine were disenrolled due to death, relocation, or reduction in EMS calls. Conclusions: These preliminary findings indicate that MIH direct engagement and care coordination yield a reduction in 9-1-1 utilization. This study was limited by a small sample size and lack of randomization, but strongly indicates that additional investigation is warranted.


Background: Law enforcement (LE) naloxone programs aimed at early recognition and treatment of opioid overdoses have increased. Implementation is often challenged by emergency medical services (EMS) engagement, which may impact adoption and overall success. The objective of this study was to analyze the implementation of a naloxone pilot program at a large urban LE agency supported by local EMS providers. We hypothesized that with direct training and interaction with EMS providers, LE adoption would be high. Methods: This prospective pilot program was conducted between May 2016 and December 2016. LE officers, investigative personnel, and support personnel underwent training by the city’s fire-based EMS providers. LE training included identifying the symptoms of opiate overdose, and administration of naloxone if opioid overdose was suspected and respiratory depression was present. LE personnel were deployed with 2 mg naloxone doses administered intranasally with a mucosal atomizer device. At the end of the study, LE personnel completed a survey concerning their training and experience with naloxone administration. LE clinical performance was monitored for each naloxone administration. Outcomes included patient survival at the time of EMS arrival, and the results of the post program survey. Results: A total of 124 LE officers underwent naloxone training with 31 (25%) LE officers administering naloxone to 38 suspected overdose patients. Thirteen (42%) administered naloxone to more than one patient. Fifty-six (57%) of the patients received a single 2 mg dose of naloxone, and 2 (3%) of the patients received two 2 mg doses of naloxone. Of the treated patients, 98% (57/58) patients survived to EMS arrival. The post program survey demonstrated that 82% of LE officers felt they received adequate naloxone training, 90% felt that the program promoted timely and safe use of naloxone, and 94% reported a reduction in the number of overdose issues on the scene. Conclusions: This study suggests that urban LE agencies partnered with EMS may successfully implement LE administration programs for suspected opioid overdoses. Limitations to this study include the lack of patient-centered outcomes, and the significant number of LE officers that did not administer naloxone.

201. ASSOCIATION OF CASE VOLUME PER AMBULANCE STATION WITH OUTCOME OF OUT-OF-HOSPITAL CARDIAC ARREST (OHCA)

Tae Han Kim, Sang Do Shin, Kyong Jun Song, Ki Jeong Hong, Young Sun Ro, So Yeon Kong, Seoul National University Hospital, Department of Emergency Medicine Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Sufficient case volume for emergency medical service may be important for retention of resuscitation skills and procedures during prehospital management of Out-of-Hospital Cardiac Arrest (OHCA). We evaluated association of case volume per ambulance station with outcome of OHCA. Methods: Nationwide data of all adult OHCA during 2013 to 2014 was retrospectively analyzed. OHCA ambulance stations were stratified in to 4 groups according to annual average number of OHCA treated by EMS teams dispatched from each ambulance station. Multivariable logistic regression model was conducted to evaluate effect of increased case volume per ambulance station on survival outcome of OHCA. Results: From 2013 to 2014, total of 47,637 OHCA were reported by EMS teams from 1,205 ambulance stations nationwide. Mean annual number of OHCA dispatched from each ambulance station was 19.0 cases. Overall survival at discharge rate was 5.5% with 2.9% of discharge with favorable neurological outcome. Survival was highest in groups with largest case volume (7.2% in group 4 [largest case volume group 1 smallest case volume group]). Adjusted odds ratio of largest case volume per ambulance station for predicting survival was 1.4965 (95% CI 1.26 – 1.70). Conclusions: Larger case volume per ambulance station might be associated to survival outcome of EMS treated OHCA. Appropriately prehospital EMS dispatching strategy according to case volume should be further studied.

202. RESOURCE UTILIZATION AND CLINICAL OUTCOMES OF OLDER ADULT EMS PATIENTS WITH TRAUMATIC BRAIN INJURY (TBI) WHO WERE TRANSFERRED TO A LEVEL I TRAUMA CENTER

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Background: Traumatic brain injury (TBI) is a substantial source of death, disability, and healthcare utilization among older adults. Older patients are frequently under-resourced by EMS to community hospitals and require subsequent transfer to a trauma center for further care. However, a minimal amount is known regarding the outcomes of care and patient outcomes at the final receiving hospital. We aimed to describe trauma center care among geriatric trauma patients with TBI. Methods: We conducted a secondary analysis on a sub-cohort from a prospective multi-center study focusing on ambulance and emergency department (ED) care of injured older adults transported via ambulance. The current analysis focused on patients transferred to the region’s Level I trauma center from another hospital. The trauma center for the present study serves a nine county catchment area of over one million people. Transfer paperwork from the originating hospital was reviewed, and each medical record abstraction was conducted, including
204. CHANGE IN THE UTILIZATION OF EMERGENCY CARE AFTER ESTABLISHMENT OF EMERGENCY MEDICAL SERVICE (EMS) AGENCY: A BEFORE AND AFTER CROSS-SECTIONAL ANALYSIS

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Background: In effort to address the shortage of emergency medical care in Cameroon, Yaoundé Medico-Surgical University Hospital (CURY) was established in June, 2015 in Yaoundé, Cameroon. To evaluate its impact on the communities of Yaoundé, we assessed the changes in utilization of emergency medical care since the establishment of CURY. Methods: In 2014 the first survey was conducted on randomly selected 619 households (3,358 individuals) living in six health districts of Yaoundé. In 2017 the second quantitative survey was conducted on 634 households (3,466 individuals) using the same survey methods as the first survey. In both surveys, data on demographic information, socioeconomic status, and utilization of healthcare, including emergency care in the past year were gathered from a member of the households via face-to-face interview. Data on two surveys were compared and emergency unit utilization by the distance from CURY was examined. Results: In both surveys we have observed increase in utilization pressure and flow were positively associated with JVF (r = 0.51, p < 0.01). The increase was regardless of the distance from the patients’ residential places to the emergency medical center, a finding that suggests the establishment of an emergency medical center may have impacted the utilization of emergency care throughout the entire communities of Yaoundé.

205. PREHOSPITAL PUMP DOSE EPINEPHRINE IN HYPOTENSION

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Background: Hypotension is commonly encountered in the prehospital arena and occurs in the setting of illness, trauma or may be iatrogenic during rapid sequence intubation (RSI). The mainstay of prehospital treatment has been intravenous (IV) fluids; however, this method is not always effective. Push doses of epinephrine or phenylephrine, so called "push-dose" epinephrine, has been long been used by anesthesiologists for acute hypotension in the operating room. Push dose epinephrine (PDE) offers another advanced life support (ALS) providers to combat hypotension. Methods: A retrospective review of data collected for the administration of PDE for the management of acute hypotension in the prehospital setting. We included patients >17 years old with systolic blood pressures <90 mmHg during the peri intubation period. Primary outcome was cardiac arrest. Secondary outcomes included changes in vital signs and shock index (SI). We performed descriptive analysis on demographics, biometrics and derived the mean, median and standard deviations for continuous variables of both the interventional and control group. Results: PDE was given a total of 75 times in the two-year study period. 22 of these were peri-intubation (treatment group). Mean age in PDE was 69 years vs. 72.4 years in the control group (P = 0.1). The mainstay of pre- and post-intubation vital signs of patients receiving PDE, we found significant increases in mean HR, SBP, DBP, MAP, and SI (P < 0.01). In the control group SBP, DBP, MAP, SI, and RR all achieved a statistical significant decrease of the mean (P < 0.001). The mean dose of epinephrine was 10 micrograms (range 10–80mcg); 17.2% of peri-intubation patients in the control group went into cardiac arrest. Only 4.5% of patients in the treatment group went into cardiac arrest. This did not reach statistical significance. Conclusions: PDE used in the management of peri-intubation hypotension in the prehospital setting resulted in statistically significant improvements in SBP, DBP, MAP, and SI. The control group experienced statistically significant worsening of vital signs after intubation. Overall, fewer patients went into peri-intubation cardiac arrest after receiving PDE. Readily available, safe, and rapidly effective, PDE is a useful tool to combat acute hypotension in the prehospital arena.

206. ACCURACY OF STROKE DISPATCH BY A LARGE URBAN EMS DISPATCH SYSTEM

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Background: Stroke is a time sensitive emergency that requires appropriate triage of EMS transport planning. The existence of hospitals with varying stroke-care capabilities and more recently mobile stroke units (MSUs) necessitates early recognition of stroke symptoms and accurate triage of patients to appropriate resources. This study investigates the accuracy of the EMS dispatch system in a major U.S. metropolitan area in predicting the likelihood of a patient having a stroke. Objective: The objective of this study was to evaluate the accuracy of stroke recognition by a large urban EMS dispatch system in the United States. Methods: We performed a retrospective cohort study looking at the initial dispatch for stroke within a large urban area EMS system. We then compared these patients to a stroke registry from a large urban tertiary hospital in the same city over a two-year period (2015–2016). Results: Over the study period, a total of 33,910 patients were transported to the tertiary care hospital for any complaint, including 778 patients with an initial dispatch code for stroke. Of the patients with initial dispatch coded as stroke, 133 were then confirmed as truly having a stroke based on stroke registry data. Dispatch for stroke had a sensitivity of 43.2% (95% CI 37.6–48.9), specificity of 98.1% (95% CI 97.9–98.2), positive predictive value of 17.1% (95% CI 15.1–19.3), and negative predictive value of 99.5% (95% CI 99.4–99.6). Conclusions: These findings imply EMS dispatch alone is not sufficient to rule in stroke. In a population of MSUs, hypotension should lead to patients being inappropriately triaged to this resource due to the 82.9% false positive rate. The authors conclude that (1) MSUs, hypotension on initial dispatch are required to ensure appropriate triage of potential stroke patients for intercept by a MSU or transport to a stroke center and (2) EMS systems need triage protocols to avoid inappropriate triage of non-stroke patients to such resources as MSUs to ensure patient safety and to prevent delays in definitive care.