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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. 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.

2. EMS Agencies with High Rates of Field Termination of Cardiac Arrest Care Also Have High Rates of Survival

John Summers, Christopher Berry, Anne Knorr, Mark Olaf, Douglas Kupas, Gesinger Health System Category of Submission: Cardiac

Background: The relationship between field termination of 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 (OOHCA) 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 upon FTOR frequency. The top and bottom quartiles were identified as high (HFTAs) and low (LFTAs) field termination agencies (LFTAs). Generalized estimating equation models were used to compare HFTAs and LFTAs. Results: Seventy agencies were classified as HFTAs (treating 31,486 OOHCA patients) and 70 agencies were classified as LFTAs (treating 27,314 OOHCA 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. When compared to LFTAs, HFTAs spent greater time at the scene before patient transport (25 min vs. 16 min, 95%CI 16.5–20.0, p < .001) and were more likely to administer drugs to patients (92.0% vs. 86.7%, 95%CI 1.0–2.1, p = .04). Conclusions: EMS agencies with the highest rates of FTOR also have higher rates of ROSC, survival, and good neurologic outcome. HFTAs spend more time on scene before patient transport, suggesting they may not have a culture of “scoop and swoop” for OOHCA care. Additional studies are needed to identify any subgroup of OOHCA that may benefit by transport for care at a hospital.

3. Prehospital Delivery of Death Notifications Associated with Higher Rates of Occupational Burnout Among EMS Professionals


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 survivorship, training and work-related 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 step-wise 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: Among with out-of-hospital cardiac arrest (OHCA), opioid abuse and over-dose (OD) were some of the most pressing health problems in the US. While opioid-related deaths have increased in the US, recent temporal and regional trends in the proportion of OD-OHCAs are largely unknown and may impact treatment strategies and outcomes. **Objective:** To assess trends in incidence, process of care, and outcomes of OD-OHCAs and compare with non-OHCA. **Methods:** Statewide observational study utilizing an Utstein-style database, along with detailed review of EMS records linked 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. Multivariable logistic regression was carried out to compare survival between the two groups. **Results:** There were a total of 21,688 confirmed OHCA from 2010 to 2015. After excluding non-C-OHCA/ non-OD-OHCAs, 18,988 cases remained. Overall, 18,001 (94.8%) of arrests were C-OHCA and 987 (5.2%) were OD-OHCA. We found a significant increase in the proportion of OD-OHCAs from 2010 to 2015: 4.6% (95% CI = 3.8–5.4) and 2015; 4.6% (95% CI = 5.7–7.3). Mean age for OD-OHCA 18-64 only was 64.2 years (p < 0.0001) and location of OD-OHCA were more likely residential 66.6% vs. 54.0% (p < 0.0001). Shockable rhythm was present in 70.8% of OD-OHCAs which was 22.6% of C-OHCAs (p < 0.0001). Bystander CPR was performed in 49.4% of OD-OHCAs vs. 48.3% of C-OHCAs (p = 0.05). Out-of-hospital discharge in the OD-OHCA group was 18.6% vs. 19.7% in the C-OHCA group (p < 0.0001). After risk adjustment, there was an OR of 2.0 (1.6–2.5) for survival in comparison to the OD-OHCA group compared to the C-OHCA group. **Conclusions:** This statewide study found a significant upward trend in the proportion of OD-OHCAs 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

**Bentley Bobrow, Michal Panczyk, Robyn Blust, Paula Brazil, Taylor George, Vatsal Chikani, Chengcheng Hu, Daniel Spaite, Arizona Department of Health Services Category of Submission: Operations, Quality, Safety, Systems, Disaster**

**Background:** EMS professionals face high levels of chronic physical/emotional stress and Post Traumatic Stress Disorder related to pre-hospital 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 of suicide compared to other occupations in the general (GP) in Arizona. **Methods:** Observational study of adults (≥18 years, 1/2009–12/2015, Arizona Department of Health Services Information Management System-Electronic Death Registry was queried with manual review of decedent occupation free-text fields. These data were compared to the non-EMS cohort aggregate of all other occupations combined. **Results:** There were a total of 349,793 GP deaths (all causes) of which 7,775 (2.2%) were by suicide. EMT death total was 1,205 EMT–65 (5.2%) by suicide. Demographics of suicide: Mean age: GP= 48.7 yrs; EMT = 43.4 yrs (p = 0.023); Male: GP–77.3%; EMT–88.8% (p = 0.029); White non-Hispanic: GP–80.8%; EMT–73.5% (p = 0.166). The crude odds ratio (OR) for EMT suicide was 2.43 (95%CI = 1.88–3.13) compared to the GP. The adjusted OR (aOR) for EMT suicide was 1.39 (95%CI = 1.10–1.77) compared to the GP. The top three mechanisms of suicide among EMS and the GP in Arizona, respectively, were firearm (67% vs. 57%), suffocation (24% vs. 21%), and poisoning (9.5% vs. 17%). **Conclusions:** In this statewide analysis, EMTs in Arizona had a significantly higher proportion mortality ratio of deaths due to suicide compared to other occupations controlling for age, sex, race, and ethnicity. This is the first study that we are aware of to compare EMS suicide completions with the general public. Hopefully this information will increase awareness and spur studies to elucidate underlying causes and evaluate the effectiveness of interventions.

7. Assessment of the Rapid Arterial Occlusion Evaluation (RACE) Scale in Real-World Practice for Prediction of Large Vessel Occlusion and Reducing Time to Thrombectomy

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**Background:** 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) scale can be reliably implemented in a real-world setting with multiple EMS agencies and by different treatment. **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 scale using an online training video. All EMS stroke alerts were recorded. When EMS RACE score was 5 or higher, the neurocath lab team was alerted prior to EMS arrival as part of a parallel workflow. Upon emergency department arrival, the following characteristics were tracked: NIHSS score, RACE score, CT findings, presence of LVO and workflow time metrics. **Results:** During the study period (January 2016 to June 2017), RACE score was provided for 797 of 1498 EMS stroke alerts (53%). Higher prehospital RACE scores correlated with NIHSS scores. LVO was found in 13% of patients with an available RACE score. A RACE score of 5 or higher was able to identify 64% of all LVO patients (sensitivity: 64%; specificity: 72%; PPV: 30%; NPV: 95%; accuracy: 71%; Youden’s index). However, of the 260 patients with RACE score 5 or higher, only 66 patients (26%) were found to have LVO stable. Among EMS alert cases where the NIHSS was ≥6, 16.1% had LVO; among 499 patients with RACE score less than 5, LVO was present in 38 patients (8%). When an EMS stroke alert with high RACE score triggered early alert of the neurocath lab team, median door to groin puncture time for thrombectomy was 68 minutes compared to 91 minutes for cases with sequential workflow. **Conclusions:** The RACE scale can be.
successfully implemented across EMS agencies and results in faster door to groin puncture time. While RACE scores of 5 or lower is associated with greater likelihood of LVO, there are a significant number of false positives. Further refinement of prehospital stroke severity score was attempted 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: Pediatric
Background: EMS crews commonly limit on-scene care for pediatric out-of-hospital cardiac arrest (POHCA) patients, typically attempting to provide transport while transporting. Hypothesis: Neurologically-intact survival for children can be improved by deferring transport and prioritizing on-site care using standard of care on-scene drug administration and intubation with tightly-controlled ventilation.
Methods: Data for all consecutive POHCA cases between January 1, 2012 and April 30, 2017 inclusive (n=384, prospectively [inclusive Utstein-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 both pre-changes (Phase I) and post-changes (Phase I) were then compared to Phase I and II outcomes. Throughout the study, protocols followed the 2010 American Heart Association guidelines. No other relevant 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 5.3-year study period throughout which the majority of children continued to present in asystole, including those nuscuated. 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 0). Children in Phase I received intubation and intraosseous insertion in much greater frequency on-scene in Phase I and II with no other significant differences in terms of age, sex, etiology, response intervals, 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 0 of 38 for the pre-change calendar years of 2012–2013 (p = 0.0001; 2-tailed Fisher’s exact test). By 2017, the mean time to epinephrine administration had fallen to 2 minutes for resuscitated patients and 3.33 minutes for all patients. Conclusions: Although a historically-controlled, observational study, the sudden appearance of a Bonferroni adjustment for multiple comparisons was used to evaluate differences in reason for leaving EMS between EMTs and paramedics (n=4793/51,344 responses [response rate = 10%] and 2,703 met inclusion criteria. Most were EMTs (85%, n = 2,291) and 15% were paramedics (n = 412). For EMTs, the most commonly selected reason for leaving EMS was the pursuit of further education (22%), while paramedics most commonly cited a desire for better pay and benefits (30%). Although a two-fold increase in the proportion of paramedics that selected illness/injury/disability compared to EMTs (13% vs. 6%, p < 0.001). Three times as many EMTs selected stress/burnout compared to EMTs (9% vs. 3%, p < 0.001). Only 5% of EMTs listed retirement as the most important factor for leaving EMS compared to 32% of paramedics (p < 0.001). Excluding those who left for retirement, 68% of EMTs stated they intended to return to EMS, compared to 52% of paramedics (p < 0.001). Conclusions: Important factors related to leaving EMS differed by provider level. Of concern, a larger proportion of paramedics reported illness/injury/disability/illness as their primary reason for leaving the profession compared to EMTs. Additionally, fewer paramedics reported an intention to return to EMS. Limitations include potential response bias and confounding. Conclusions: Important factors related to leaving EMS differed by provider level. Of concern, a larger proportion of paramedics reported illness/injury/disability/illness as their primary reason for leaving the profession compared to EMTs. Additionally, fewer paramedics reported an intention to return to EMS. Limitations include potential response bias and confounding.

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 age-specific cut points are not used. Conclusions: Step cut points for FTDS were compared to age-specific cut points to better identify 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 time intervals or their encounter with the patient. Children were considered to need a TC if they met a published consensus definition. Outcome data was obtained through structured hospital record review. The following age-specific 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 cut points. Traditional cut points were used and 23% when age-specific cut points were used. Using the traditional physiologic criteria, 46% of children needing a TC could 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 3.32 (95%CI 2.94–3.47). The age-specific RR cut point had a +LR of 1.86 (95%CI 1.50–2.32). 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 Antiarrhythmics for Out-of-Hospital Cardiac Arrest: A Systematic Review and Network Meta-Analysis

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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 OHCA. The effect of lidocaine 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.
When compared to placebo, both amiodarone (1.18; 95% CI: 1.08–1.30) and lidocaine (1.18; 95% CI: 1.07–1.30) were associated with a statistically significant increase in survival to hospital admission (certainty of the evidence was high). However, no antiarrhythmic was statistically significantly associated with improved survival to hospital discharge or neurologically intact survival, and no antiarrhythmic was convincingly superior to any other for any outcome (for all values, risk of bias for the outcome was low or very low). Conclusions: Amiodarone and lidocaine were the only agents associated with improved survival to hospital admission in the meta-analysis. In the most relevant context, that is, prior to transfer to patients, survival to hospital discharge and neurologically intact survival, no antiarrhythmic was convincingly superior to any other or placebo.

12. Emergency Medical Services Provider Perspectives on Pediatric Calls: A Qualitative Study


Background: Previous survey results in our ambulance service indicate that 9-11 response to incidents involving children are particularly concerning 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 9-11 calls involving pediatric patients. A total of 37 providers from rural and urban areas participated in six focus groups. Focus groups were audio recorded and transcribed using standard coding, memoing and content analysis methods in qualitative analysis software (NVivo). Results: Key findings that emerged were: (1) the administration of hypertonic saline (intervention), compared to an isotonic fluid (control), improves survival to hospital discharge (outcome). Methods: In this PRISMA registered review, searches were conducted in Medline, Embase, CINAHL, and CENTRAL from the date of database inception to November, 2016, and included all languages. Two reviewers read and selected randomized controlled trials of hypertensive human participants administered hypertonic saline in the prehospital setting. The comparison was isotonic fluid, which included lactate, 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 and were analyzed as a fixed-effects model (i.e., no significant heterogeneity was observed). The pooled relative risk of survival to hospital discharge with hypertonic saline was 1.02 times that of the control fluids. The pooled relative risk of survival to hospital admission (certainty of the evidence was moderate) was 1.07 to 1.30 (p = 0.01; referent: normal saline). The pooled relative risk of survival to hospital admission (certainty of the evidence was moderate) was 1.07 to 1.30 (p = 0.01; referent: normal saline). The pooled relative risk of survival to hospital discharge with hypertonic saline was 1.02 times that of the control fluids. The pooled relative risk of survival to hospital discharge with hypertonic saline was 1.02 times that of the control fluids.
16. EFFECTS OF FAILED DEFIBRILLATION
ATTEMPTS ON WAVEFORM CHARACTERISTICS OF THE VENTRICULAR FIBRILLATION 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 measures for patients with VF in out-of-hospital cardiac arrest (OHCA).

Methods: Electronic defibrillator data were taken from non-traumatic, EMS-treated OHCA cases from the Resuscitation Outcomes Consortium (ROC) Eastern Pennsylvania (5/05-8/13). Complete QECG data were analyzed. QECG parameters compared were peak-to-peak voltages, wavelet entropy, and 80% frequency (CF), and detrended fluctuation analysis (DFA) was calculated for the closest artifact-free 3 second gap in chest compressions prior to and after the shock. We used custom-built MATLAB programs to perform QECG calculations. QECG values were compared using a paired t-test for the pre- and post-shock values. Correlation coefficients were also calculated between the time from shock to post-shock window and the changes in QECG values.

Results: Out of 5,195 total shocks, 1,399 shocks were analyzable. 520 were the first shock. For all shocks, AMSA increased from 4.83 to 5.60 (p-value < 0.01). MS increased from 2.36 to 2.44 (p-value = 0.01). CF increased from 7.05 to 7.16 (p-value < 0.01). DFA did not show any change. 1.28 to 1.27. For only first shocks, similar findings were observed. No difference appeared between time to post QECG measurement and the change in QECG values.

Conclusion: Defibrillation with the QECG measures except for DFA, a slight improvement in values was observed. While statistically significant, these changes may not be physiologically or clinically meaningful. Future directions include: (1) These may be a result of the CPR delivered in between the shock and the post-shock QECG; (2) The pre-shock values started very low which may make decreases difficult to detect from a floor effect. These basic waveform forms may be less harmful than those previously studied.
obviously not mutually exclusive. Hence, the next logical step in evaluating the influence of both hypoxia and hypotension on outcome (both separately and combined) appears to be far more complex than the current literature reflects (only being assessed dichotomously as present or not). Future TBI studies should account for both the presence of sepsis, ICU admission, and in-hospital mortality increases consistently across the quartiles (Q) of unadjusted dose score (No hypoxia or hypotension: 5.6%; Q1–16.5%; Q2–20.9%; Q3–25.1%; Q4–31.0%). In the adrenergic model, the mortality increase is remarkably monotonic (indeed, nearly linear) with increasing dose score. Across the entire range of dose scores, both the standard deviation of adjusted dose score is associated with a 63% increased odds of death (aOR = 1.63) among patients with either hypoxia or hypotension or both. The result is strongly supported by the highly significant, monotonically-increasing relationship between the separate hypoxia and hypotension dose and their adjusted death rates.

Conclusions: Both hypoxia and hypotension depth/duration appear to have a profound and additive influence on TBI mortality. Their influence on hypoxia and hypotension on outcome (both separately and combined) appears to be far more complex than the current literature reflects (only being assessed dichotomously as present or not). Future TBI studies should account for both the depth and duration of prehospital hypoxia and hypotension.

20. ASSOCIATION BETWEEN INDUCTION AND SEDATION AGENTS AND POST INTUBATION HYPOXIA IN TRAUMA PATIENTS

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Background: Medications used for rapid sequence intubation and post-induction sedation may cause hypoxia, resulting in secondary injury and worse outcomes after trauma. We identified patient and treatment characteristics associated with post-intubation hypoxemia. Methods: We retrospectively reviewed charts from consecutive patients undergoing transport between January 2001 and June 2016 by STAT MedEvac, a multistate critical care transport service with >10,000 missions per year. We identified adult trauma patients intubated by a flight crew member. The primary outcome was early post-intubation hypoxemia, defined as a systolic blood pressure (SBP) < 90 mmHg, SpO2 < 90% within 15 minutes of intubation. We used logistic regression to identify predictors of post-intubation hypoxemia. The adjusted dose score was calculated as 100 * (SBP/70) + (SpO2/100) for all adult trauma patients were intubated and transported. Mean age was 44 years, 26% were female, mean pre-induction heart rate was 99 bpm, and mean SpO2 was 96% (IQR 95, 100), and respiratory rate was 18 (SD 7). A total of 14% of patients experienced post-intubation hypoxemia. Patient factors independently associated with hypoxemia included pre-intubation SpO2 (aOR = 1.03, 95% CI 1.02–1.04), female gender (aOR 1.40, 95% CI 1.06–1.85), lower SBP (aOR 0.96, 95% CI 0.96–0.97), higher heart rate (aOR 1.01, 95% CI 1.00–1.01) and lower SpO2 (95% CI 0.97–0.98). Paralysis with succinylcholine was associated with increased odds of post-intubation hypoxemia (aOR 1.39, 95% CI 1.07–1.80) while pre-intubation treatment with lidocaine (aOR 0.70, 95% CI 0.52–0.94), post-intubation treatment with fentanyl (aOR 0.23, 95% CI 0.18–0.30) and post-intubation treatment with sodium saline (aOR 0.30, 95% CI 0.10–0.88) were associated with a decreased occurrence of post-intubation hypoxemia.

Conclusions: In trauma patients undergoing critical care transport, multiple patient factors and modifiable treatments including administration of succinylcholine were independently associated with hypoxemia. Additional investigation is needed to confirm this effect and identify other patient and treatment factors associated with post-intubation hypoxemia. In the interim, current protocols and clinical practice should be reviewed.

21. PREHOSPITAL LACTATE: A SEVERITY INDICATOR IN EARLY SEPSIS MANAGEMENT

Kurt Isenberger, Aaron Burnett, Jeffrey Anderson, Adam Mayer, Sandi Wewerka, Joseph Pascarella, Rakesh Frascone, Rosens Hospital Category of Submission: MEDICAL

Background: Serum lactate levels can rapidly dictate clinical awareness of shock and prompt intervention in sepsis. Collecting serum lactate levels is restricted to the hospital setting. The objective of this study was to investigate whether a prehospital lactate value (PL) improves time to intervention upon ED arrival. We hypothesized that EMS communication of a PL value to the ED physician would result in improved time to antibiotics and an in-hospital lactate (IL) order. Methods: This prospective, observational study included patients with a prehospital lactate order (PL) based on SIRS criteria. A POCT PL was collected by paramedics prior to ED arrival, and reported during presentation. ED metrics were collected and compared to a previously collected control group (CG) of patients presenting with-out a PL but who met early sepsis criteria. Cox regression models were used to estimate hazard ratios (HRs) with 95% confidence intervals (CIs) for time to physician order for an antibiotic or in-hospital lactate test. Results: Study patients (age 60–96) included 170 with PL measures and 269 controls. The PL group was older on average (mean age, 69 vs. 54; p < 0.001), and was more likely to have expired in the hospital (10% vs. 5%; p = 0.027). An antibiotic was ordered for 104 prehospital lactate patients (61%) and 216 controls (80%). In a Cox model adjusted for age and gender, the CG had a nearly two-fold faster rate of time to antibiotic order (HR = 1.95, 95% CI: 1.50, 2.48), relative to prehospi-tal lactate patients. Among the PL patients, time to antibiotic order did not differ by PL (>2 vs. <2 mmol/L; p = 0.545). Time to IL order did not significantly differ between CG and patients with PL >2 mmol/L (p = 0.811), but time to IL order was twice as slow for patients with PL ≤2 mmol/L (vs. CG, HR = 0.50, 95% CI: 0.22, 1.10). Conclusion: In this small study, the availability of PL value did not improve time to antibiotics. Patients with a normal PL had a prolonged time to antibiotic order (HR = 0.50, 95% CI: 0.22, 1.10). A larger study is required to validate these results.

22. PREVALENCE OF MORTALITY DUE TO REBOUND TOXICITY AFTER "TREAT AND RELEASE" PRACTICES IN PREHOSPITAL OPIOATE OVERTOXIC CARE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Jennifer Greene, Brent Deveau, Justine Dol, Michael Butler, Dalhousie University Category of Submission: MEDICAL

Background: Death from fentanyl overdose was declared a public health crisis in Canada in 2015. Traditionally, patients who have overdosed on opiates that are managed by emergency medical services (EMS) are treated with the opiate antagonist naloxone, provided ventilatory support and subsequently transported to hospital. However, certain EMS agencies have allowed paramedics who have reversed an opiate overdose to refuse transport, if the patient has the acuity to do so. The safety of this practice has not been examined by a systematic review. Therefore, our intent is to examine the available literature to determine the prevalence of mortality and serious adverse events within 48 hours of EMS treat and release due to suspected rebound opiate toxicity after naloxone administration. Methods: A systematic search was performed on May 11, 2017 in PubMed, Cochrane Central, Embase, and CIHAL using search strategies developed with the aide of a health sciences librarian. No search limits were applied. Included studies had to be from a North American source. Two authors conducted the screening, selection and data extraction process. Discrepancies were resolved via discussion. A modified QC tool was used to assess risk of bias. Analysis for prevalence of outcomes were performed. Results: A total of 1,401 records were screened after duplicate removal. Eighteen full text studies were reviewed for potential inclusion. Included studies had a low risk of bias. The prevalence of mortality within 48 hours was so infrequent that it could not be quantitatively meta-analyzed. There were 4/4912 (0.00081%) total reported deaths of suspected rebound etiology from included patients across all studies. Only one study reported on adverse events of patients released on scene. This study found no incidence of adverse events from their sample of 71 released patients. Conclusions: Mortality or serious adverse events in these included studies due to suspected rebound toxicity in patients released on scene post EMS treatment with naloxone was rare. Despite limited studies, the prevalence rate was so low that we concluded that this practice may be safe in terms of mortality and may be considered an alternative of traditional transport. Additional prospective studies need to be performed to strengthen knowledge around adverse events.

23. PREHOSPITAL qSOFA SCORE AS PREDICTOR OF SEPSIS, MORTALITY AND MORTALITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

Meta-Analysis

UCSF-Fresno; Department of Emergency Medicine

Jennifer Greene, Brent Deveau, Justine Dol, Michael Butler, Dalhousie University Category of Submission: MEDICAL

Background: The quick Sequential Organ Failure Score (qSOFA) was proposed in 2016 as a rapid way to identify adult patients with suspected infections who are likely to have poor outcomes. A 2016 study showed that the qSOFA score could predict patient outcomes if evaluated in the prehospital setting. We hypothesize that prehospital qSOFA scores are correlated with up-triage (change to a higher acuity level) to trauma zone or zone 2 by paramedics, presence of sepsis, ICU admission, and in-hospital mortality. Methods: We conducted a
retrospective observational study using prehospital ambulance vital signs to calculate qSOFA score for adult medical patients transported to a hospital emergency department from September 2016 to August 2017. The study found that, among 1,903 adult medical patients transported by ambulance to the emergency department during the study period, of these 151 patients (7.93%) were prehospital qSOFA positive. A 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), 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 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), and in-hospital mortality (6.62% vs. 0.74%; p < 0.001). A positive prehospital qSOFA score was not associated with up-triage (7.95% vs. 5.92%; 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 is correlated with diagnosis 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 that were 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 Stepahnie, Thomas Leirmoe, Stephanie Schroter, E. Brooke Lerner, Manish Shah, Baylor College of Medicine, Pediatrics, Section of Emergency Medicine Category of Submission: PEDIATRIC

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 protocol in 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 to reach 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, control of the scene, and physical accessibility of medication on scene. System barriers included equipment availability, controlled substance management, infrequent training, few pediatric calls, underestimation of a possible seizure, and incorrect 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 shared other opinions about management: preferences for intramuscular vs. oral medication, how transport distance affects management, use of online medical control, and the need to manage bystanders. Providers suggested areas 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 IN PEDIATRIC PATIENT SCENARIOS AFTER IMPLEMENTATION OF STATE-WIDE PEDIATRIC DRUG DOSSING REFERENCE
John Hoyle, Glenn Ekbald, Tracy Hover, Bill Fales, Richard Lammers, Dena Smith, Western Michigan University, Homer Stryker, MD School of Medicine Category of Submission: PEDIATRIC

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 PDR. Agencies completed 2 validated, pediatric scenarios: infant seizure and infant cardiac arrest. Agencies were public, non-profit for profit, urban, rural, and suburban. These scenarios 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 all the steps to administer a drug dose. Two evaluators scored crew performance via direct observation and video review. A dose error was defined as > 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 EMT-P/EMT-P. 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%) benzdiazepine 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%) the crew was unable to dilute DS0 to DS2. Unrecognized air bubbles were frequently entrained in the administration syringe resulting in underdoses. In 31/31 (100%) 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 and using the length-based tape for 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, Remie Crowe, Madison River, Brian Clemency, Robert Swor, Ashish Pant, E. Brooke Lerner, 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 sampling of 20,000 nationally-certified 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 = 0.58) respondents 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 ALS (43%) 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 providers delivered a death notification in the past year; however, one-third of these EMS providers had not received training, and this training was associated with greater comfort and preparation in delivering death notifications. Limitations include recall bias attributed to self-report. Future work is needed to identify 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
department via EMS without a cervical collar rarely have serious cervical spine injuries. In a retrospective analysis, it was identified that a motion restriction (SMR) protocol was associated with decreased cervical collar use. We sought to determine if this decreased use was associated with a decrease in serious cervical injuries among 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 for motor vehicle collision to one of three hospitals. EMS and hospital data were collected between three periods from 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 injury present in patients who died as a result of traumatic injuries. Results: There were 1,614 patient records identified, 819 under-triaged, compared to 1,54 (41.1%) and 1,41 (28.5%) 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: A 37-item instrument adapting 10 domains from the SOPS instruments and one new domain capturing the unique EMS 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 31,464 included those with a higher practice experience 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 model fit (0.90 for the index, 0.40), and factor variances (0.5). We assessed domain reliability and validity using Cronbach’s alpha (cutoff: 0.6) and Pearson’s correlation coefficients (r; cutoff: 0.3). Results: We evenly 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 for the index), root mean square error of approximation = 0.06. 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. Important limitations include potential response bias and the inability to aggregate data at the agency level. Future work should focus on agency-level data testing.

29. Explaining Disparities in Field Triage of Older Adults: Factors that Influence EMS Destination Decisions and Reasons for Over- and Under-Triage

Courtney Jones, Jeremy Cushman, Julius Cheng, Martina Anto-Ocrah, Nancy Wood, Heather Lenhardt, Molly McCann, Suzanne Gillespie, Ann Dozier, Jeffrey Bazarian, Melanie Sh, University of Rochester School of Medicine and Dentistry Category of Submission: Trauma

Background: The Field Triage Decision Scheme (FTDS) is designed to identify severely injured patients and guide EMS providers’ selection of a destination hospital, but a minimal amount is known regarding the real-world application of these criteria. We aimed to identify the factors that influence EMS destination decisions, the extent to which these decisions align with the FTDS, and explore EMS provider-identified reasons for over- and under-triage of older adults. Methods: We conducted a prospective multi-center study at four hospitals within a county, one of which was a verified Level 1 trauma center which serves a nine county region of over one million people. We enrolled all older adults aged 55 or older who sustained an injury of any severity and were transported by EMS. Research staff administered a standardized interviews-based survey with the patient’s EMS provider. FTDS criteria was used as the gold standard to assess patterns of destination decisions and adherence to protocol. We used descriptive statistics to characterize the study sample and used chi-square tests to assess factors that influenced destination decisions and agreement between EMS decisions and the FTDS. Proportions were used to quantify reasons for under- and over-triage.

Results: Data from 4,295 patients were analyzed. The median age was 75 years and 59% were female. Using the FTDS as a gold standard for destination decisions, 1,584 patients (43%) were over-triaged and 285 (42%) were under-triaged. There were only 2 patients (2%) who met the mechanism criteria who were under-triaged, compared to 154 (11.4%) and 141 (47.2%) who met the physiologic and anatomic criteria who were under-triaged, respectively. Of those who were sent to the trauma center, the most frequently cited reason by EMS was patient request (60.5%). Of those who were under-triaged to the non-trauma centers the most frequently cited reasons by EMS was patient request (61.4%) and need for non-trauma center (13.7%). Conclusions: EMS provider destination decisions are influenced by mechanism of injury, but a substantial proportion of patients who meet mechanism criteria and anatomic criteria of FTDS were under-triaged. Both under- and over-triage appear to be heavily influenced by patient preference.


Background: To determine if the Mechanism of Injury step of the Field Triage Decision Scheme (FTDS) is accurate for identifying children who need the resources of a trauma center (TC). Methods: EMS providers transporting any injured child ≤15 years, regardless of severity, to a pediatric TC in three midsize communities over 3 years were interviewed. Collected data included EMS observed physiologic condition, suspected anatomic injury, and suspected mechanism of injury. Patients were considered to need a TC if they met a consensus-based definition. Data were analyzed with descriptive statistics including positive likelihood ratios (LR) and 95% confidence intervals (95%CI). Results: A total of 9,484 provider interviews were conducted and linked to hospital data to obtain patient outcome. Of those we needed to exclude those under 15 (11.6%) and 28.5% motor vehicle crash (MVC) (26 needed TC), 28.5% motorcycle crash (MCC) (none needed TC), and 28.5% had a mechanism not on the FTDS (12 needed TC). Among those with a >10 feet, 2 needed a TC (LR 5.41; 95%CI: 1.37–21.00). Among those in a MVC, 42 were reported to have been ejected and none needed a TC. While 63 had reported intrusion (22 under- and 1 under TC), and 1 needed a TC (LR 5.41; 95%CI: 1.37–21.00). Conclusions: Over a quarter of the cases needed the resources of a TC are not identified in the physiologic or anatomic steps of FTDS. The mechanism of injury step of the FTDS does not include a quarter of the mechanisms experienced by children transported by EMS for injury. Use of the mechanism step does not appear to greatly enhance identification of children who need a TC. More work is needed to improve the identification of children who need the resources of a TC.

Poster Presentation Abstracts (31–206)

31. Appropriate Needle Length for Emergent Pediatric Needle Thoracostomy Utilizing Computed Tomography

Maria Mandt, Kathleen Adelgais, Kari Hayes, Fred Serevon, Children’s Hospital Colorado Category of Submission: Pediatric

Background: Needle thoracostomy is a lifesaving procedure. Advanced Trauma Life Support guidelines recommend insertion of a 5 cm, 14-gauge needle for pneumothorax
decompression. High-risk complications can arise if utilizing an inappropriate needle size. New studies evaluating 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 heart disease, musculoskeletal disease, pectus deformity, anasarca, prior open thoracotomy, inadequate imaging, or missing height documentation. We established four groups based upon Broselow color: (1) left ICS-AAL 1.5 cm (ICS-MCL 1.6 cm) (ICS-AAL 1.5 cm, 0.06 cm), right ICS-AAL 1.7 cm (ICS-MCL 1.5 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.8 cm, 0.2 cm), right ICS-AAL 1.8 cm (ICS-MCL 1.6 cm, 0.2 cm), left ICS-AAL 1.7 cm (ICS-MCL 1.9 cm, 0.1 cm), right ICS-AAL 1.8 cm (ICS-MCL 1.7 cm, 0.1 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.5 cm, 0.1 cm), right ICS-AAL 1.7 cm (ICS-MCL 1.6 cm, 0.1 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.7 cm, 0.1 cm), left ICS-AAL 1.5 cm (ICS-MCL 1.6 cm, 0.06 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.5 cm, 0.06 cm), right ICS-AAL 1.7 cm (ICS-MCL 1.6 cm, 0.06 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.5 cm, 0.06 cm), right ICS-AAL 1.8 cm (ICS-MCL 1.6 cm, 0.06 cm), left ICS-AAL 1.5 cm (ICS-MCL 1.6 cm, 0.06 cm), right ICS-AAL 1.7 cm (ICS-MCL 1.6 cm, 0.06 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.7 cm, 0.06 cm), right ICS-AAL 1.8 cm (ICS-MCL 1.7 cm, 0.06 cm), left ICS-AAL 1.7 cm (ICS-MCL 1.6 cm, 0.06 cm), left ICS-AAL 1.6 cm (ICS-MCL 1.5 cm, 0.06 cm), right ICS-AAL 1.8 cm (ICS-MCL 1.6 cm, 0.06 cm). Conclusions: Median chest wall thickness varied by location 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 Van Aarsen, 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 remains unknown. The goal of 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 following out-of-hospital cardiac arrest (OOHCA) for those who underwent vector change defibrillation, compared to those who received standard treatment. Methods: This was a retrospective analysis of adult (≥ 18 years) patients presenting in rVF during OOHCA 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 or VF was defined as the absence of VF after a vector change or standard defibrillation during the next rhythm analysis. Results: There were 372 OOHCA, with 25 (6.7%) patients entering treatment of 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. Termination of rVF or vector change defibrillation was 8.8 (7.1–11.1) minutes. Eight (50%) patients had termination of VF 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. The randomized controlled 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 implemented as a means of facilitating rapid ED treatment of acute strokes. These alerts are dependent upon the performance of validated stroke screen protocols, treatment of blood glucose to eliminate a common stroke mimic. EMS Compass has identified several performance measures that may assist in determining overall quality of CPR. Use of these measures could provide a benchmark for EMS agencies across the country.

Methods: Using anonymous data from 9-4-1 national dataset and 2018-2019 events, we documented the proportion of all patients who had a prehospital ROSC, the proportion of all patients who had a prehospital ROSC with a stroke alert, and the proportion of all patients who had a prehospital ROSC with a stroke alert and blood glucose within normal limits. We also documented the proportion of all patients who had a prehospital ROSC with a stroke alert and blood glucose within normal limits who were transported from the scene to the hospital. Of these, 88,751 patients or 52.6% (52.3–52.9%) 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. The randomized controlled trial is warranted to test whether or not vector change has a role in the termination of rVF.

34. Effect of Instructor’s Real-Time Feedback During Layperson Cardiopulmonary Resuscitation Training on Quality of CPR Performances: A Prospective Cluster Randomized Trial

So Yeon Kong, Sang Do Shin, Kyong Jun Song, Tae Han Kim, Gwan Jin Park, Department of Emergency Medicine, Hallym 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, CPR 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 performance in terms of the 9 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 < 0.01). The mean proportion of CPR performance from baseline to last session, trainees in the intervention group demonstrated significant improvements on overall quality of CPR compared with those in the control group (QCPR feedback Δ = 11.64 (95% CI 9.75–13.53)); Conventional feedback Δ = 6.96 (5.16–8.76); p < 0.001). A 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 difference between two groups (p = 0.06). In this cluster randomized 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 Scheppeke, Peter Antevy, Daniel Millstone, Charles Coyle, Craig Prusansky, 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/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 feasibility of such a bundled technique using mechanical chest compression and cardiopulmonary CPR devices used at an angle. Methods: The EMS system catchment (pop. 1.4 million) is geographically expansive with broad ethnic variation. So the ability to perform adequate CPR during prehospital cardiac arrest is crucial. Results: We randomized 132 subjects into two groups: intervention and control. The intervention group received mechanical CPR with a 30° angle to the horizontal plane, while the control group received standard CPR. The primary outcome measure was the change in ICP during and after CPR. Results: There were no statistically significant differences in ICP between the intervention and control groups during CPR. Conclusions: This preliminary evidence suggests that mechanical chest compression with a 30° angle to the horizontal plane is safe and feasible during CPR.
diversity, extremes of age and socioeconomic status and low frequency of bystander CPR. Through an electronic registry of out-of-hospital cardiac arrest (OOHCA) cases (all rhythms) were followed over 3.5 years (January 1, 2014 through June 30, 2017; n = 2,285). EMS rates and time intervals using the Lucas device and impedance threshold device (ITD), but, after April 1, 2015, they also: (1) applied O2 while defibrillating positive-pressure ventilation and ITD application was continued for 2 minutes; (2) raised the backboard ~20° (head/torso-up) following ITD application; and (3) solidified a pit-crew approach for device application. With neuro-intestinal failure data not available until 2015, “short-term” survival (sustained resuscitation by EMS to hospital admission) was used for consistent comparisons. Quarterly reports were run to identify any periodic variations or incremental effects during protocol transition (in Quarter 2, 2015). Results: There were no complications/difficulties in using the head/torso-up position (n = 1,319). Of 806 consecutive OOHCA cases attended between January 1, 2014 and March 31, 2015, quarterly (all rhythms) survival rates remained constant (mean 17.8%), range 15–20%) but rose steadily during the transition period with an ensuing sustained doubling (35.18%; range 30–40%) for the next two years (July 1, 2015 through June 30, 2017). Outcomes subgroups and response intervals, indications for initiating CPR and bystander CPR rates were unchanged. EMS resuscitation rates in 2016 and 2017 were found to be non-significantly longer but more efficiently during the transition phase with a subsequently sustained doubling of survival chances, making a compelling case that this protocol change improved OOHCA outcomes in future clinical trials.

36. INTRAOSSEOUS ACCESS USE IN CHEMICAL, BIOLOGICAL, RADIONUCLIDE, AND NUCLEAR PERSONAL PROTECTIVE EQUIPMENT Tim Collins, Clinical & Medical Affairs, Telefax Medical Category of Submission: Operations, Quality, Safety, Systems, Disaster Background: To determine comparisons of success rates and ease-of-use ratings in achieving intraosseous access in both wearing and non-wearing of Chemical, Biological, Radionuclide and nuclear personal protective equipment (PPE) in a cadaver model. Methods: Using a cross over design, eight experienced paramedics inserted an intraosseous (IO) device (Arrow EZ-IO) into a cadaver specimen wearing their standard prehospital clothing. The sample then crossed over and applied CBRN PPE and repeated IO insertions. IO insertion times were recorded and assessed for clinical accuracy both before and after cross over with wearing CBRN PPE. Data collection involved the sample completing a confidential questionnaire assessing self-perceived ease-of-use scores for IO access measured in Likert scales (0–10). Qualitative data was captured following structured focus group interviews. Results: The results found no statistical difference between ease-of-use scores for IO access between wearing or non-wearing CBRN PPE. No difference in determining land marking for IO access (p = 0.75 vs. 0.726), humeral site insertion (M 9.13 vs. 8.75 p = 0.593), administration of IO saline flush (M 9.25 vs. 8.75 p = 0.056), healing and manipulating driver (9.13 vs. 8.75 p = 0.753) and trocar removal (9.25 vs. 8.75 p = 0.405). The mean ease-of-use scores were found to be lower in CBRN group but not significant, focus group discussions stated that PPE had some restrictions but effective EZ-IO insertion could still be achieved. Insertion times (25 secs SD 3.46 vs. 34.38 secs SD 5.80, p = 0.056) were not statistically longer with wearing CBRN PPE. However, focus group discussion stated that it would take significantly longer to achieve intravenous (IV) access with the IO due to a more intimate and faster option compared to IV during a CBRN incident. Conclusions: Intraosseous access can be effectively and promptly achieved while wearing CBRN PPE. However, in addition 9.4 seconds while wearing CBRN PPE which can provide fast and efficient vascular access during a CBRN incident.

37. REPRIORITIZATION OF 9-1-1 EMERGENCY MEDICAL CALLS USING HISTORICAL CLINICAL DATA Veer Vithalani, Sabrina Vik, Steven Davis, Neal Richmond, Office of the Medical Director; Medstar Mobile Healthcare Category of Submission: Operations, Quality, Safety, Systems, Disaster Background: Emergency Medical Services (EMS) systems often utilize a structured approach to 9-1-1 call-taking and emergency medical dispatch (EMD). One such system, Medical Priority Dispatch System (MPDS), categorizes the presenting problem and severity, with response priorities determined at the local level through a predetermined response matrix. In this study, we propose a methodology for utilizing historical clinical data to increase the accuracy of 9-1-1 call prioritization of patients with time-sensitive critical illness. The primary objective is to increase the number of patients with time-sensitive critical illness who receive the highest-priority response (“Priority 1”). The secondary objective is to decrease the number of Priority 1 responses to patients who do not have time-sensitive critical illness. Methods: All 9-1-1 calls-for-service in a large EMS system, between December 1, 2015 and November 30, 2016, were included. Electronic patient care reports (ePCRs) were analyzed for time-sensitive critical illness, including any patients in whom the EMD suspected or who required airway management or electrical therapy (pacing, cardioversion, or defibrillation). The percentage of calls with time-sensitive critical illness was calculated for each of the 382 EMD codes in the MPDS. In our proposed response matrix, any codes which had at least 1% of patients with time-sensitive critical illness were assigned a theoretical Priority 1 response. Results: Out of a total of 119,287 actual calls-for-service, 30,123 (25.2%) were assigned a Priority 1 response through the current response matrix; 1,205 (4%) of these patients had time-sensitive critical illness. Utilizing our proposed methodology, these same calls-for-service would have resulted in 25,441 (21.3%) Priority 1 responses, including 1,333 (5.2%) patients with time-sensitive critical illness. The net result would have been an overall 15.5% decrease in Priority 1 responses, and a 10.6% increase in Priority 1 responses to patients with time-sensitive critical illness. Conclusions: Historical clinical data may be used to increase the accuracy of call prioritization of patients with time-sensitive critical illness, while simultaneously increasing operational efficiency and 9-1-1 resource utilization.

38. KINK IN THE STROKE CHAIN OF SURVIVAL: IS EMS APPROPRIATELY PRENOTIFYING THE ED OF SUSPECTED STROKES? Jeffrey Nusbaum, Nachiketa Gupta, Alec Gluckman, Michael Redlener, Kevin Munjal, Mount Sinai Hospital Category of Submission: Student, Resident, Fellow Background: The purpose of this study was to determine rates of prenotification in a large universe of patients suspected of having had an acute stroke and to determine factors associated with appropriate prenotification. Methods: This was a retrospective cohort study of all patients with a discharge diagnosis of CVA, TIA or intracranial hemorrhage who arrived by EMS between January 1 and December 31, 2015 at three urban hospitals. Patients transferred from another hospital were excluded. “Get with the Guidelines” data was matched to data from the prehospital care reports. Appropriate prehospital notification was defined by checking 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 (p = 0.01). Shorter EMS LKN times were associated with increased rates of prenotification (p < 0.01). Prenotification was more likely in patients with high NIHSS (p = 0.01) and with facial droop (p = 0.04). In a multivariate logistic regression including the three components of the CPSS, slurred speech was the only independent 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 17% increase in use of tPA administering tPA (p = 0.06). Conclusions: Prehospital providers are not consistently providing prenotification. In our cohort, EMS prenotified 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 EMS 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) patients. The association between prehospital advanced airway management (AAM) and survival outcomes was 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 AAM on outcomes between regional EMS systems of four Asian cities. Methods: We used a PAROS (Pan-asiaresuscitation outcomes study) registry. We identified patients with OHCA after 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-points were survival discharge and neurologic recovery. We compared outcomes between the AAM and non-AAM groups using multivariable logistic regression with an interaction term between AAM and four Asian cities (Osaka, Seoul, Singapore, and Taipei), after adjusting for potential confounders. Results: Among 27,375 patients, 16,510 patients were included in the final analyses. Survival discharge and 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 (Cl) 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. Results 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 CPR PERFORMANCE: MONOPHONY RESUSCITATION QUALITY MEASURES IN TEAMS OF EMS PROVIDERS

Christopher Berry, Pamela Humphrey, Anthony Halupa, Stephen Taylor, Jarrett Shugars, Douglas Kupas, Gujar Singh. System Category of Submission: CARDIAC

Background: High-quality cardiopulmonary resuscitation 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 of cardiac arrest events from a training hospital in which participants were exposed to specific teaching interventions (RCDP) of specific teaching interventions was conducted, focusing on the RCDP of specific teaching interventions. The intervention included using coaching and RCDP to teach techniques of palm lift, two-person two-thumbs-up bag-mask ventilation, uptick ventilation during continuous compressions, and chest compressions during defibrillator charging. CPR metrics included: compression fraction, compression rate, percentage of compressions with full depth, full depth of full recoil, percentage of compressions between 100–120 per minute, ventilator rate, percentage of cycles with full depth ventilation, duration of longest pause. Outcomes were assessed, before and after educational interventions, with a 5-minute resuscitation case simulating a witnessed cardiac arrest with ventricular fibrillation. The intervention used included coaching and RCDP to teach techniques of palm lift, two-person two-thumbs-up bag-mask ventilation, uptick ventilation during continuous compressions, and chest compressions during defibrillator charging. CPR metrics included: compression fraction, compression rate, percentage of compressions with full depth, full depth of full recoil, 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 = .002), n2 = 0.60, percentage of compressions with full recoil (52.7% vs. 85.6%; p = .001), n2 = 0.60, percentage of adequate ventilation volume (38.5% vs. 57.4%; p = .002, n2 = 0.55), and longest pause in compressions (16.6 sec vs. 6.2 sec; p = .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 ANALOGIES 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, age and race or ethnicity, with evidence showing African American individuals receive fewer procedures or less medical care than 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 into the High Fidelity Training Skill Tracks database between January 1, 2014 to December 31, 2015. Cases were extracted if aged 16 to 100 years, the patient was alert 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 age and gender and analgesia administration. The adjusted log odds of patients receiving any analgesic was tested with bimodal 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 log odds of analgesia than non-Caucasian patients (p < .0001). When analgesic administration is adjusted for age category and gender, African Americans have the lowest long odds of any analgesia when compared to Caucasian patients (OR 0.65. p < .0001). 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. PARAMEDICS PROVIDING PALLIATIVE CARE AT HOME: PATIENT AND FAMILY SATISFACTION

Alix Carter, Judah Goldstein, Marianne Arab, Michelle Haddad, Vivien Heath, Mireille Lecours, Carolyn Villard, James Sullivan, Dalhousie University Category of Submission: DISASTER

Background: Paramedic crisis and symptom management courses for providing palliative care with the goal to treat in place re- present a novel approach to care. A new clinical practice guideline, additional medications, and a Palliative Care Primary Care Essential Approach to Palliative Care (LEAP) Mini for Paramedics were implemented in two provincial EMS systems. Our objective was to determine patient and family satisfaction, and changes in AMSA during CPR (dAMSA) in a preclinical porcine model with a 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 15-minute period of CPR. Data were collected at baseline, 5 minutes, and changes in AMSA during CPR (dAMSA), in relationship with the duration of untreated VF, coronary perfusion pressure (CPP), and epinephrine administration.

Results: Overall AMSA decreased from 13.7 ± 0.8 mVHz to 6.5 ± 1.7 mVHz during the 15 minutes VF (dAMSA −7.2 ± 2.5 mVHz, p < .001), while it increased to 17 ± 1.2 mVHz after 5 minutes of CPR (dAMSA 10.5 ± 3.5 mVHz).
While numerous implementation barriers are 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 of methods in different contexts (e.g., urban 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). Conclusions: While numerous implementation barriers are well described, there is a paucity of evidence for optimal prehospital EBG implementation methods. A quality improvement program was recently implemented to provide simple, goal based feedback to prehospital providers after each resuscitation. Expanding upon current feedback to prehospital providers after each prehospital patient, future prospective studies should compare implementation methodologies in different prehospital contexts. EBG projects should also include implementation methods, with “lessons learned” compiled in an easily accessible repository. Funding priorities should include implementation research to ensure the efforts of EBG development translate into practice.

45. Are There Disparities in Dispatch CPR Instruction Receipt and CPR Performance?

Amanda Amen, Patrick Karabon, Brian McNally, Cherrie Bartram, Kevin Irwin, Kimberly Vellano, Robert Swor, Oakland University William Beaumont School of Medicine Category of Submission: Operations, Quality, Safety, Systems, Disaster 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 or other) and Utstein 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 that had received Utstein data and census tract data. The population was predominantly white (70.0%), male (66.0%), with an average age of 63.5 +/- 18.7. DA-CPR instructions were more commonly given to incidents that occurred in a private residence [ORadj: 3.89, 95% CI (2.5-5.5)] 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)]. Black race was not different by socioeconomic or demographic characteristics. Conclusions: 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 (indoor 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 less 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 1,000 people and included indoor 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.
the implementation of the form were evaluated. Metrics measured included the means and rates of (1) successful attempts for compression rates, depth, and fraction as well as preshock pause time. Results: A total of 439 before encounters and 621 after encounters were evaluated including 59 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), and preshock pause 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 3 attempts (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 AAM attempts needed for success. We also characterized the cumulative AAM success rates in a national cohort of Emergency Medical Services (EMS) agencies. Results: A total of 61,793 patients from 552 EMS agencies underwent AAM interventions. 77,754 CA-ETI, 38,063 NA-ETI, 19,138 NA-EVI, 7,229 RSI, 3,095 SAI, and 9,993 SGA. The number of AAM attempts per patient varied (median 1, range 1–10). 35% of AAM attempts resulted in success (FPS) and overall success (OS). The number of attempts needed to reach OS was calculated. Results: There were 254,856 patients analyzed. Of these, 287,719 [54.8% (54.7–55.0%)] had a documented weight. There were 43,063 children with AAM in the population, 37,689 of these [87.5%, (87.2–87.8%)] had at least one OS and Respiratory Rate documented. 6,202 children had an impression of asthma and 4,336 of these had received a beta-agonist. Of those children with an impression of asthma, 755 were hypoxic and 635 [84.1% (81.5–86.7%)] of them received a beta-agonist. Conclusion: These are the first benchmark performance measures using a large national cohort. These results may but are still low. Multiple attempts are common and often unsuccessful. These results may be used to inform national series, first pass prehospital AAM success rates, and determine the cumulative AAM success rates in a national cohort.

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 providing AED utilization rates and time-to-first-shock times by equipping taxis with AEDs. Methods: A prospective observational feasibility study conducted in Singapore, a densely populated Southeast Asian nation with 5.54 million people on a land area of 719 square kilometres. There are 3,300 ambulances with asthma and an SpO2 <90%. For measures requiring administration of a medication, only AALS providers were included. For each measure, a rate and 95% Confidence Interval were calculated. Results: There were 524,856 patients analyzed. Of these, 287,719 [54.8% (54.7–55.0%)] had a documented weight. There were 43,063 children with AAM in the population, 37,689 of these [87.5%, (87.2–87.8%)] had at least one OS and Respiratory Rate documented. 6,202 children had an impression of asthma and 4,336 of these had received a beta-agonist. Of those children with an impression of asthma, 755 were hypoxic and 635 [84.1% (81.5–86.7%)] of them received a beta-agonist. Conclusion: These are the first benchmark performance measures using a large national cohort. These results may be used to inform national series, first pass prehospital AAM success rates, and determine the cumulative AAM success rates in a national cohort.

59. PERFORMANCE MEASURES USING A LARGE NATIONAL DATASET: PEDIATRIC CARE

Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nuddell, 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. Although the current state of resident medical command training is limited. We sought to assess the state of medical command training in EMS 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 assessment of improvement. 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 9% of those programs (88.1%) reported that their residents do receive formal medical command training. A majority of these 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 (56 programs, 57.7%) or online-based (75 programs, 77.3%) training. EM physicians are the primary individuals providing training (91 programs, 93.8%). Most programs allow their residents to begin 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 (65 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 reviewed (86 programs, 93.2%). Conclusions: Most EM residencies train their residents in providing medical command, yet there is wide variation as to how this essential skill exists and literature describing this current state of resident medical command training is limited. We sought to assess the state of medical command training in EMS residency programs.
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 choose to 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” misatriaged 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 (CIs) calculated when appropriate. Results: Out of 17,639 patients from 2007–2015 who were evaluated by ALS and triaged to BLS, 372 were transferred to BLS. The average age of patients was 66.4 years CI (61.0–71.7) and 52% were female. The most common misatriaged final diagnosis category was Neurological, 24% CI (23.3–24.7), followed by GI/Abdominal Emergencies 15% (14.3–15.7%). Sepsis was misatriaged 10.2% CI (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 misatriage is needed to recognize prehospital Neurological and Abdominal/GI Emergencies to avoid near misses in the future. More research is also needed to determine which interventions had poor outcomes as a result of being misatriaged to make triage protocols safer for our patients.

53. ASTONISHING RATES OF SUICIDALITY IN EMS PROVIDERS: A HIDDEN EPIDEMIC

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

Background: Suicidality. Past suicidal thoughts and attempts workplace stress, which increases their risk of suicide, (2) frequency of suicidal ideation over time which patients, if any, had poor outcomes. 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 established cut-off score to determine the relationship between suicidality and gender, age, shift-length, 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: 30.8% (95% confidence interval: 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 length, 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 suicide-related behaviors exist within the EMS community; however, further 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, Damodar V. V., 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 study was to determine the incidence of paramedic reported suspicion of infection, and to compare the accuracy of published paramedic screening strategies for sepsis within the emergency medical services (EMS) patient population.

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; 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% Confidence 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 (0.73–0.75)]. The lowest negative LR [0.080 (0.04–0.08), 0.372 (0.24–0.30), and 0.390 (0.37–0.42), respectively] for ruling out sepsis. The FPR score (high risk) and Sepsis Alert strategies had high specificity [0.980 (0.98–0.98) and 0.999 (0.99–1.0)], and positive LR [19.7 (17–22) and 13.6 (11.6–16.0)] for ruling in sepsis. Theويلber score had lower sensitivity [0.581 (0.48–0.70), 0.07 (0.06–0.08)]. Comparing the gSOFA score recommended in the Sepsis-3 definition to the previously recommended SIRS score, gSOFA was better for ruling in sepsis and negative 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, Ashley 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 includes the so-called 9-1-1 callers, some of whom may return home from hospitals with 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 discharging hospitals to start a new home visit program under Maryland’s new Mobile Integrated Health (MIH) Protocol beginning March 2017. We wished to establish if this additional intervention was associated with a reduction of EMS call volumes from enrollees in the protocol. Hypothesis: Initiation of follow-up home visits by our paramedics and hospital outreach nurses has an impact on EMS utilization by a selected group of enrolled 9-1-1 super-users. Methods: After our EMS-HHS partnership identified 9-1-1 super-users, we recruited a voluntary sample of patients to start a 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 protocol 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 18 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 that the large system benefit from a coordinated program of EMS partnerships with public health agencies and hospitals. Furthermore, the initiation of Hospital Outreach and the initiation of follow-up home visits had preliminary impacts on call volumes generated by the enrollees over a 30–90 day period. More studies are needed to predictively prove valuable characteristics and best practices of these programs, and which interventions during home visits make the most difference.

56. MULTIDISCIPLINARY COMMUNITY HEALTH CARE INTERVENTIONS REDUCE EMS UTILIZATION BY ELDERLY

Joseph Petrosino, Jeffrey Boyd, Joanne McGovern, James Dziura, Gina Stover,
Background: Previous studies in a small, suburban town showed that more than half of elders who fall and require lift assists will activate the 9-1-1 system again within 30 days. Community-based observation involves paramedics, visiting nurses, and primary care providers substantially reduced the frequency of repeat EMS and lift assist calls. This study was designed to evaluate these findings across larger and more diverse populations of elders at risk for falls. Methods: For this non-randomized, prospective study, informed consent to follow subsequent health care utilization was obtained from 2,265 participants residing in AMR’s regional response areas. Participants chose to have no intervention, or the interventions that included sequential home visits by a research paramedic evaluating disability and home safety, a visiting nurse assessing for home health care requirements and eligibility, plus an offer of free transportation for any care provider visit. Participants were enrolled during (1) an EMS call for lift assist, (2) an ED visit, or (3) self-referral. Subsequent EMS calls were captured by these findings in our study database with those in AMR’s call records. Outcomes compared the proportion of participants that had at least one EMS call during the 30 or 90 days following enrollment (nonintervention group), or completion of the intervention, using a generalized estimating equation approach, in SAS. Results: As of May 31, 2017, 980 non-intervention group participants completed >30 days of follow up, and 652 completed >90 days. As of 1,285 intervention group participants completed >30 days, and 980 completed >90 days. The intervention group showed a 51% reduction, and at 90 days, a 38% reduction in the proportion of participants with at least one EMS response (both p < 0.001), compared with nonintervention. ED enrollees benefited most, with a 45% reduction in EMS utilization at 30 days (p < 0.001), and a 25% reduction at 90 days (p = 0.009). Conclusions: This study demonstrates short-term effectiveness of our multidisciplinary community health care interventions at reducing EMS utilization. ED enrollees may benefit most, and metrics the group that was most disabled at baseline, appeared to benefit the most from the interventions.

57. Effect of Sodium Bicarbonate Administration During Out-of-Hospital Cardiac Arrests on End-Tidal CO2 Readings in Considering Termination of Resuscitation
Brandon Morshed, Alysha Joseph, Ray Fowler, University of Texas – Southwestern Category of Submission: Cardiac
Background: The administration of sodium bicarbonate (NaHCO3) during out-of-hospital cardiac arrests (OHCA) has been shown to produce increased end-tidal capnography (EtCO2) during resuscitations. Traditionally, EMS systems may authorize termination of resuscitation (TOR) efforts after prolonged periods where the EtCO2 remains <10 mmHg. However, if NaHCO3 has been administered, the EtCO2 may be elevated, possibly resulting in prolonged resuscitation efforts. The purpose of this study was to determine the effects of the administration of NaHCO3 during OHCA on EtCO2. We hypothesized that there would be a noticeable increase in EtCO2 readings between OHCA TOR patients who received NaHCO3 and those who did not. Methods: 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 data were analyzed to identify all patients for whom the Provider Impression was “Cardiac Arrest.” The records were individually examined to determine the EtCO2 readings at which 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 36.7 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 this year. This study indicates that administering NaHCO3 during OHCA will significantly elevate the EtCO2, and NaHCO3 administration complicates the utility of the EtCO2 for determining TOR. 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 Marzko, MD School of Medicine, Quinnipiac University Category of Submission: Student, Resident, Fellow
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 the times of 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 Gurnard TraumaMan mannequin and a dedicated 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 (e.g., shorter times) as group size increased. Results: There were 37 simulations including 142 participants. The feedback survey questions achieved a Cronbach’s alpha of 0.91 signifying high reliability. Trend analysis supported 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 recordings (p = 0.002). Delays revealed significant linear trends (p < 0.001 for delays in recording, p > 0.001 for delays in care), as increasing group size corresponded with lesser delays. Greater improvement was noted to be between groups of 2 and 4 participants. OHCA 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 (PSTV) 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 is to determine the accuracy of ACP identification of PSTV.

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 of 150 bpm, were included. Paramedic call reports were retrospectively reviewed for study data, including documentation of ACP identified PSTV. The reference standard was consensus between a fellow and prehospital physician who adjudicated each ECG for the presence of PSTV in a blinded, independent fashion. In the event of a disagreement, a third, blinded prehospital physician was used for adjudication. Of the 442 patients included, 197 (45%) were male and the median age [Interquartile range (IQR)] was 70.0 years (58.0–82.8). ACPs identified 74 (16.7%) patients as having PSTV, 48.5% had a history of previous arrhythmia, compared to 31.9% of patients with no ACP identified PSTV (p = 0.026). They were also significantly younger (63.0 (47.0–77.0) compared to those without ACP identified PSTV [median[IQR] = 72.0 (61.0–85.0)] (P < 0.0001). Sensitivity of ACP identified PSTV was 73.9% (95%CI: 66.4–80.0) and specificity was 90.6% (95%CI: 87.3–93.3%). The positive predictive value (PV) of ACP identified PSTV was 85.8% (95%CI: 78.9–91.4%), the negative predictive value (NPV) was 97.2% (95%CI: 95.8–98.5%), the positive likelihood ratio (LR) was 10.4 and the negative LR was 0.03. Moderate inter-rater agreement was found, with the overall kappa = 0.42, 95%CI:0.29–0.54)

Conclusions: These results indicate that ACPs are adept at identifying PSTV, but are prone to false positives while relatively good sensitivity and specificity seen in this investigation, future studies should investigate ACP recognition of specific rare arrhythmias (antidromic accelerated junctional tachycardia) 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 providers that 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 and EMS records for each patient 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 year/age, type, and EIS 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 127,707 CAD events, only 2243 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 but at a Greater extent of medical intervention and hospital resource utilization were comparable. Both had similar number of ventilator, ICU, and hospital days. There was no difference in mortality rates. In this study, TEMS providers exhibited shorter response times and performed medical interventions at similar rates to traditional EMS. Although there were no differences in ROSC, when 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, Jose Cabanas, Paul Hinche, Lawrence Brown, Dell Medical School at the University of Texas Category of Submission: CARDIAC

Background: Deploying mechanical CPR in out-of-hospital cardiac arrest (OHCA) is logistically challenging. Inefficient deployment might explain reports of delayed times to deployment and outcomes associated with mechanical CPR. We hypothesized that in an EMS system with optimized deployment, sustained improvements in survival 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 19 of 20 of STEMI) 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 attempt identifying the E2B, and using propensity score matching to select cases with and without mechanical CPR that had similar patient demographics and arrest characteristics. We excluded patients who achieved ROSC following only CPR or defibrillation without medication administration, terminations of resuscitation without meaningful resuscitation attempts (including DNRs), and EMS-witnessed arrests. All prehospital data were obtained from the EMS electronic health record; hospital outcomes were obtained from the trauma registry. Results: Of 444 eligible OHCA, 227 received mechanical and 217 received traditional CPR. Crude ROSC (29.1% vs. 39.2%) and survival to hospital discharge (5.7% vs. 13.8%) were lower with mechanical CPR, but mechanical CPR cases were also less likely to be witnessed arrests and less likely to present with a shockable rhythm. In the propensity-adjusted analysis of 187 patients with mechanical CPR well-matched to 187 patients with traditional CPR, both ROSC (29.2% vs. 39.5%; difference = −10.3%; CI: 0.7% to −19.9%) and survival to discharge (7.0% vs. 14.1%; difference = −7.1%; CI: −9.0% to −13.1%) remained significantly lower for patients receiving mechanical CPR. Conclusions: In an EMS system with optimized deployment, mechanical CPR was associated with decreased ROSC and decreased survival to discharge.

63. Gender Disparities in the Prehospital Setting Among Known ST- Segment Elevation Myocardial Infarction Patients

Krystal Bacia, Stephen Sanko, Mark Eckstein, University Of Southern California- Los Angeles County And Los Angeles County USC College Of Medicine Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Identification of a ST 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 that 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 public system, the San Antonio Urban EMTs, to STEMI-Receiving Centers (SRC) from January 2011 to December 2015 and were diagnosed with a STEMI, had emergent PCI, and were found to have a culprit coronary artery obstruction. Our primary outcome was EKG-to-balloon time (EB). Our exclusion criteria were: interfacility transfer, age under 18, inability to calculate E2B and/or STEMI patients. Our secondary outcomes were: time intervals from 9-1-1-call through device time. Results: Of the 2,778 patients eligible for analysis, 2,148 patients were included in final analysis after application of the exclusion criteria. Women had longer on-scene times, longer times from 9-1-1-call to arrival at the SRC, time from first medical contact (FM) to balloon, and time from 9-1-1 call to EKG (p < 0.001). Time from first medical contact to cath lab arrival was longer in women, but did not reach statistical significance (p < 0.002) using a very conservative Bonferroni-corrected p-value. There were no statistically significant differences in whether or not a prehospital EKG was performed or transmitted, whether a prehospital EKG indicating STEMI was noted, whether or not aspirin was given, transport time, time from EKG to cath lab at SRC, or time from EKG to cath lab at SRC but not having EKG or door-to-balloon (p > 0.01). Conclusions: Our study demonstrates women are more likely to have delayed times from 9-1-1-call to hospital arrival, FM to balloon, and time from 9-1-1 call to EKG but not have delays from E2B or door-to-balloon time. Limitations include short transport times, a single urban EMS service, and the retrospective nature of the study.

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. 10.5%, respectively). In males, there was a greater refusal rate than women (8.5% vs. 7.3%, p = 0.001). Diabetes-related problems (36.2%) and motor vehicle accidents (28.3%) resulted in the highest refusal rates (p < 0.001). The highest percentage of overall refusals occurred during the 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. 0.001). Conclusions: In this population, geriatric patients had lower refusal proportions; whereas, prior studies suggested that geriatric patients are greater than younger age groups. The greater refusal rate among men is consistent with previous literature. Prior studies have shown the highest rates of refusals for vehicle accidents and other trauma, 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 Fitzgibbons, Emily Lovallo, Marek Radomski, Jeremiah Escayda, Christian Martin-Gill, Department of Emergency Medicine, University of Pittsburgh School of Medicine 

**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. 

**Methods:** We deployed a portable ultrasound device (iViz, 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 iViz device. POCUS use was limited to identifying cardiac motion during cardiac arrest, walls of motion, and visualizing septal interruption resuscitation, and the results could be used to guide management at the physicians’ discretion. Data were recorded prospectively by saving images 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. Secondarily, we characterized image quality (and fellowship-trained) faculty review (using kappa statistic for agreement), and identified barriers to the use of prehospital POCUS. 

**Results:** Of 155 surveys completed, 147 (95%) were fully completed and included data on POCUS use and/or patient care. 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. 10.5%, respectively). In males, there was a greater refusal rate than women (8.5% vs. 7.3%, p = 0.001). Diabetes-related problems (36.2%) and motor vehicle accidents (28.3%) 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. 0.001). Conclusions: In this population, geriatric patients had lower refusal proportions; whereas, prior studies suggested that geriatric patients are greater than younger age groups. The greater refusal rate among men is consistent with previous literature. Prior studies have shown the highest rates of refusals for vehicle accidents and other trauma, 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. 

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

Ali Shams, Chris Kanaan, Rebbecca Grysziewicz, Chris Kazmierczak, Laura Steucher, Robert Swor, Beaumont Health 

**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. 

**Methods:** We conducted a retrospective cohort study of patients transferred to a 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 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. 10.5%, respectively). Differences with respect to perceived provider trust, smartness, likeability or confidence. However, participants answered significantly lower on the Likert scale for willingness to discuss confidential information with the providers in the turn-around care compared to the other two attributes at an alpha of 0.0057. 

**Conclusions:** Based on our results, barriers that may impact patient perceived quality of care. Lower responses were found for turn-around care, possibly from a lack of association of EMS providers with the system. Studies drawing a 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 video, and number of outfits tested but our results conclude attire as a minor factor in EMS responses. 

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

Rickquel Tripp, Jonathan Elmer, Francis Guyette, Christian Martin-Gill, Department of Emergency Medicine, University of Pittsburgh School of Medicine 

**Background:** Emergency response without transport confers a risk of negative patient outcomes, increased liability, and non-payment. Yet, rigorous surveillance of 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 patient care records from 21 urban, suburban, and rural EMS agencies in Western Pennsylvania from April 2013 to December 2016. Additionally, age, gender, race, ethnicity, level of transport, and demographic and clinical characteristics. 

**Methods:** We
last vital signs (BP, RR, HR, SPO2, and GCS), loss of consciousness (LOC), abnormal mental status (AMS), LOC, and time of day. We excluded cases of cardiac arrest, interfacility/scheduled transports, EMS assist, no patient encountered, and patients aged <18 years. 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%) for non-transports. 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), 65.6% male, 16.8% black, 0.7% Hispanic, and 96.3% advanced life support (ALS). Incidence of abnormal vital signs were HR (N = 4435, 12.6%), SBP (N = 539, 1.5%), DBP (N = 1324, 3.8%), RR (N = 159, 0.3%), SPO2 (N = 1543, 4.4%), and GCS (N = 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 male gender (1.4, 1.04–1.87) 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. Characteristics most associated with non-transports were trauma (2.37, 1.79–3.14), dizziness/syncope (1.80, CI 1.47–2.20), and allergic reaction (OR 1.54, CI 1.33–1.79). Race, ethnicity, sex, 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?

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Background: Patients with inferior STEMI involvement 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 prehospital ECG. Patients with inferior hypotension were defined as a triage SBP less than 100 mmHg, patients with inferior STEMI was compared to patients in whom patients with inferior hypotension were used stratified by lesion location. The frequency of hypotension was compared with Fisher’s exact test and change in SBP with Hodges-Lehmann median difference. Results: Of 118 patients with STEMI, 46 were excluded for initial 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 1.35 (95%CI 1.00, 1.81) p = 0.04. Hypotension was mild; one patient with inferior STEMI arrived with SBP <90 mmHg and DBP <60 mmHg. Inter-rater reliability was excellent, kappa 0.93 (95% CI 0.80, 1.00). Mean decrease in SBP was –15 ± 23 mmHg and –10 ± 22 mmHg in inferior and other STEMI, respectively. Analysis of change in SBP and a 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 patients with ST elevation associated with complaints of trauma, dizziness/syncope (1.80, CI 1.47–2.20) and allergic reaction (OR 1.54, CI 1.33–1.79) were more likely to retest. Results: 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 was adaptive to each question. 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 retest. The maximum length testers attempted a second examination compared to minimum length testers (72%, n = 5,175; p <0.001). Conclusions: Two-thirds of first-time candidates unsuccessful on the National EMT Certification cognitive examination attempted a second examination. One-third of unsuccessful on the maximum length testers retested. Future work is needed to better understand the reasons behind candidate retesting 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

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Background: Interfacility transport of pregnant patients involves unique challenges and considerations. Data from the National Emergency Medical Services Information System (NEMSIS) dataset 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 the Los Angeles-University California Health System. The Los Angeles Fire Department (LAFD) has experienced an unsustainable increase in 9-1-1 calls. 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 mobile critical care transport team 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 from January 2013 to August 2017 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. Summative 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, 379 (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 the hospital with a medical transport directly to mental health clinics and 3 to a sobering center. Of the 360 treated and released on scene, the APRU spent an average of 23 minutes (median 1 minute, minimum 1 hour 15 minutes, median 20 minutes). Conclusions: The LAFD APRU has shown promise in decreasing costly EMS transports and improving care, by leveraging the diagnostics skills of the APP, patients can be treated and released on scene or medical 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

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Background: Unbiased estimates for field triage guideline performance are important in assessing trauma systems and improving outcomes among seriously injured patients. The accuracy of each triage component has not been evaluated in traumatic brain injury (TBI) patients. As field triage is the first 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 2013. 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 disability or alteration of mentality, related to the field triage outcome scale (FTOS) including death before event GOS. Sensitivity, specificity and area under the curve (AUC) were calculated. Results: Total 5,133 patients met the study criteria. 21.5% 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%, 57.8% and 89.3%, respectively. Among each component of criteria, altered mentality showed highest sensitivity (99.9%) and specificity (99.9%), altered mentality showed highest sensitivity and AUC for disability, which was 75.9% (95% CI 71.4% to 77.7%) and 0.671 (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

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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 (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 (PowerLab, ADInstruments, Inc). VF was induced with a 3-second 100 mA transcutaneous 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 5x1-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. Two CPR 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 a swine cardiac arrest model, early phase CPR appeared to be related to quantitative characteristics of the VF ECG.

75. Variation in the Characteristics of Patients with Acute Stroke Arriving by EMS versus Those Arriving by Private Vehicle

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Background: We conducted this study to identify differences between patients arriving by EMS versus those arriving by private vehicle with acute ischemic and hemorrhagic stroke. Determination of these differences may allow for refinement of public health experience in the timely treatment of acute stroke. Methods: This study was conducted at an academic medical center that is an accredited comprehensive stroke center. Patients with acute stroke were enrolled between January 2015 and May 2017, and were categorized by mode of arrival (EMS vs. private vehicle). The primary outcome (hemorrhagic vs. ischemic) was identified and the NIHSS measured in the ED for all stroke patients, with the ICH Score and Hunt & Hess Score determined for ICH and SAH respectively. Age, gender, PMH of stroke, and “time last known well” were identified. Statistical analysis was performed using the Yates corrected Chi-Square, Mann-Whitney, and Kruskal-Wallis tests. Of 1,935 patients were enrolled with 716 (77%) arriving by EMS and 219 (23%) arriving by private vehicle. Of these, 636 (68%) had ischemic strokes, 190 (21%) had ICH, and 17 (2%) were not classified. A greater proportion of ICH (93%) and SAH (93%) patients than ischemic stroke patients (69%) arrived by EMS (p < 0.001). Patients with a significantly higher NIHSS (9.2 vs. 2.7; p < 0.001), ICH scores (1.7 vs. 0.3; p < 0.001), and Hunt & Hess scores (2.8 vs. 2.0) than those arrive by car. The “last known normal” time was significantly lower for the EMS arrival group (mean = 547 minutes; median = 211 minutes) than the private vehicle group (mean = 1,407 minutes; median = 715 minutes). Geographical data and prior history of stroke were similar based on mode of arrival. Conclusions: Stroke patients arriving by EMS have significantly higher NIHSS, ICH score, and Hunt & Hess score and significantly shorter time from “last known well” than those arriving by car. Because a significant proportion of ischemic stroke patients arrive by private vehicle, public education efforts should focus on identification of stroke patients with longer symptom duration and those with lower NIHSS.

76. Carotid Blood Flow is Dependent on Rate and Duty Cycle during CPR Cardiac

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Background: We have previously presented data that blood flow generated by piston-type mechanical chest compressions (CC) is sensitive to changes in the inter-compression pause time, which changes both chest compression rate and duty cycle. We sought to clarify the dependence of CC generated blood flow on changes in CC rate and duty cycle during CC. We hypothesized that the observed dependence of CC generated blood flow on changes in intra-compression pause time is due to the change in CC duty cycle. Methods: CPR was performed on five domestic swine (~30 kg) using standard physiological monitoring. Blood flow was measured by Doppler in the right common carotid artery. Ventricular fibrillation (VF) was electrically induced. CC were started after 5 minutes of untreated VF. CC were delivered at a rate of 125 or 50 compressions per minute (cpm) with a duty cycle of 45% or 25% for each rate, at a depth of 2” for a total of 6 minutes after 2 minutes of “break-in” CPR (increased depth from 1 inch to 2 inches). CC rate or duty cycle were
changed every 1.5 minutes. Results: At a rate of 125 CPR, CC delivered at a duty cycle of 45% generated a mean tidal minute flow in L/min of CC delivered at a duty cycle of 27% (0.157 ± 0.086 L/min vs. 0.075 ± 0.04 L/min, respectively). However, at a rate of 50 CPR, blood flow was not dependent on duty cycle; for 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 by CPR on duty cycle for compression pause time cannot be assigned to either the change in rate or duty cycle, but is a combination of both effects. These data highlight possible mechanistic differences between piston and vest CPR.

77. Rearrest Incidence and Post-ROSC Rhythms after Prehospital Return of Spontaneous Circulation in Out-of-Hospital Cardiac Arrest

Amber Rice, Joshua Gaither, Daniel Spait, Vatsal Chikani, Sean Wentworth, Tyler Vadeboncoeur, Taylor George, Terry Mullins, Bentley University, Arizona Category of Submission: Cardiac

Background: Limited out-of-hospital cardiac arrest (OHCA) studies have found that rearrest after 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 rearrest cardiac 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 pre-rearrest ECG recordings were grouped into Utstein 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, indicating loss of pulses. Descriptive statistics were used to describe the distribution of rearrest 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 any Utstein category (34), or 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 rearrest) 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 (5.08%), V-tach (4.41%), idioventricular (6.91%), atrial fibrillation or flutter (1.88%), and junctional rhythms (1.31%). Almost half of ROSC patients in this sample (45%) sustained at least one episode of rearrest and 22 patients (7%) sustained multiple rearrests. The most common rearrest rhythms in this sample were pulseless electrical activity (62.3%) and VT/VF (32.6%).

Conclusions: This study demonstrates that rearrest was not dependent on duty cycle in cases of ROSC. In this analysis, a wide variety of both post-ROSC and rearrest rhythms were observed but rearrest appeared to be more dependent on factors such as operator experience and equipment limitations. A larger sample size would help provide EMS resources 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

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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 dispatcher-assisted cardiac arrest by dispatcher and outcomes in out-of-hospital cardiac arrest (OHCA). Methods: We conducted a cross-sectional study. All adult OHCA cases 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 with good neurological recovery. Our secondary outcome was survival to discharge with poor neurological outcomes. Multivariable logistic regression analysis was performed, adjusting for patient, arrest, environmental, and dispatcher factors. Results: Of 83,083 OHCA cases, 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 who did not receive 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 638 (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 decreased 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%): 0.68 (0.51–0.90) in the middle group, 0.68 (0.51–0.90) in the late 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%): 0.68 (0.51–0.90)] in the middle group, and Late vs Early AOR (95% CI): 0.67 (0.51–0.90) in the late group. 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 with Application of the 2015 Guidelines

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Background. Cardiac arrest survival is dependent upon chest compression quality. Target parameters for compression depth and rate became more specific from the 2010 Guidelines to the more specific 2015 Guidelines. The proportion of subjects requiring RTAVF to achieve 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 guideline adherence from the 2010 Guidelines cohort and the 2015 Guidelines cohort was 96.0% and 95.0%, respectively. The proportion of subjects that could not be corrected [3.6% vs. 4.0%, OR 1.1 (0.7–1.9), p = 0.63] became nonadherent [0.4% vs. 1.0%, OR 2.6 (0.9–9.3), p = 0.001] with RTAVF. Conclusions: The use of RTAVF increases chest compression adequacy, particularly with application of the 2015 Guidelines targets for compression depth and rate.

80. Direct Transport to Comprehensive Stroke Center May Not Expedite Reperefusion of Large Vessel Occlusion Stroke

Ali Shams, Chris Kanaan, Rebbecca Gryszlewicz, 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 reperfusion. 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). Our objective was to assess whether time to definitive care for LVO stroke patients is decreased in patients who are transferred 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 first incisional skin penetration and reperfusion at the CSC were recorded. Transfer distance was calculated using Google Maps. Because we sought to assess impact of triage with a regional EMS system, we excluded patients who are transferred within a 15-mile radius. Non parametric statistics were used for comparisons. Median and range are reported. Results: A total of 62 cases were included. Patients were transferred from 7 hospitals to a single 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 transported from hospitals. Compared to patients transferred by air or ground, patients who presented directly to the CSC had a shorter time to arrival at the CSC (175 ± 67 minutes vs. 275 ± 156 minutes, p < 0.01), and a shorter time to reperfusion (median, 30.5 (6–216) vs. 156 (30–246), p < 0.01), and 69 (25–
288) vs. 209 (99–315), p < 0.001, respectively. When comparing first hospital arrival to out-of-hospital transport times, patients IF and IF+ were associated with shorter transport times to hospital. We found no evidence of an association between treatment of patients with CC and hospital arrival time.

Conclusions: This is the first study to compare treatment of patients with CC and hospital arrival time. Our findings suggest that treatment of patients with CC may be associated with shorter transport times to hospital.

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 pressure ventilation (NIPPV) in acute decompenated heart failure have been shown to provide meaningful clinical benefit. There has not yet been work done to provide benchmarks on these measures based on large national datasets. We aim to describe national performance on these measures. Methods: Using a 6 1/2-year convenience sample of records from 9-4-1 calling EMS agencies using ESO Solutions electronic health record (EHR), we calculated compliance with the following performance measures: the average time from dispatch to first defibrillation in shockable 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 decompenated 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 11,144 cardiac arrests, a low rate of rapid defibrillation pointing out poor compliance with a chest pain bundle. Of these, 199,123 or 37.4% were transported by paramedics. There were 533,127 patients over 35 with non-traumatic chest pain. Of these, 199,123 or 37.4% (37.2–37.5%) received both aspirin and a 12 lead ECG. There were 2,612 patients with ADHF and 2,100 or 80.4% (78.9–81.9%) of these received both NTG and NIPPV. Conclusions: There was a low rate of rapid defibrillation pointing out the difficulties with achievement of this metric with current compliance (public) support. There was also poor compliance with a chest pain bundle of aspirin and 12 lead ECG use. On the other hand, there was much better use of NTG and NIPPV in ADHF. These data provide baseline performance benchmarks for use in system improvement.

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

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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 certification. To examine the association between AEMT graduate characteristics and success on the National AEMT Cognitive Examination. We hypothesized that poor performance on the examination 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 was administered assessing demographics, program characteristics, and educational experience. 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 2,372 completed the post-test questionnaire (response rate = 62%). Among those who completed the questionnaire; 50% (n = 1,923) were successful on the first attempt. Characteristics associated with no EMT experience prior to enrollment in an AEMT program, those with one to five years of experience had greater odds of passing (1.31, 1.01–1.71), while those with experience 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 impact of program entry requirements and program curriculum composition on graduate performance.

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

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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 electrocardiogram (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 and associated continuous prehospital ECG data were retrospectively extracted from defibrillator downloads obtained from the continuous chest compression (CCC) trial of the Resusciation Council of Europe (ROCC). 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 25,219 episodes comprising 1,092 unique cases. For each bout, the QECG measures AMSA, MS, LAC, and DFA were calculated for the starting and ending CC segments around the bout, and CPR performance metrics from the CCC process included rate, duty cycle, fraction, bout duration, dosed rate, dosed depth, and dosed duty cycle. We then analyzed the relationship between CC process metrics and QECG by regressing the change in QECG measures from the start each bout to the end of each bout against the CC process parameters for that bout in multivariable models including bout duration and patient characteristics.

Results: CC rate was associated with change in QECG value and was significant for change in MS (r = 2.13, coefficient 8.92, p = 0.030). All other associations between chest compression parameters and dQECG were not significant.

Conclusions: These results suggest a limited relationship between CC process metrics and QECG measures during resuscitation of out-of-hospital cardiac arrest.

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

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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 population based quantitative descriptive study, using secondary data from the provincial EMS database. Patients 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 operational 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 reported as n, percentage, as median (Q1, Q3), respectively. Results: Our electronic query retrieved 16,169 EMS responses for children and youth; of which 2108(16%) were related to MH. The median age was 14(10–19) and most MH calls were female (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 majority of patients were single users (n = 1436, 88%), whereas, 180 repeat users accounted for 503(24%) responses, ranging from 2–13 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 = 205, 10%) was the least prevalent co-morbidity, followed by Attention-Deficit Disorder/ Hyperactivity Disorder (n = 207,28%). When categorizing patients over a calendar year 1635 patients were low users (1 call per year), 189 were medium users (2–4 calls per year), 8 patients were high users (5–14 calls per year). Conclusions: We observed an increasing trend of MH call use for 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 analyze 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 evaluate the use of PDE for the management of prehospital hypotension from January 2015 to April 2017. We reviewed prehospital and in-hospital medical records for patients treated and not treated with PDE. We compared PDE treatment with crystalloid compared to patients not receiving PDE possibly indicating a selection or indication bias.

Results: 1862 eligible (SBP < 70) cases were identified, PDE was administered to 25%. Cases vs. controls differed by age, PDE median age 65 (IQR 55–76) vs. No PDE 61 (IQR 50–72), but not gender or race. Patients receiving PDE were more likely to have a prehospital arrest, cardiogenic shock, trauma and sepsis. Patients receiving PDE were also more likely to be intubated (PDE 32.4%, No PDE 14.3% Pr0.00) and vaso-pressor dependent (PDE 32.8%, No PDE 15.5% Pr0.00) prior to flight crew arrival. Patients also differed with respect to Lactate level (PDE 8.2 (IQR 4.5-9.9) vs. No PDE 3.7 (IQR2.3-7.1) and pre-treatment crystalloid (PDE 1000 IQR 500,2600) vs. No PDE (PDE 1000 IQR 200,2000). Other pretreatment variables (HR, SpO2, RR) did not differ. Conclusions: Prehospital administration of PDE is common in a fraction of patients meeting protocol criteria. PDE administration is associated with intubation, vasopressor use, increased lactate, and crystalloid use but not of PDE possibly indicating a selection or indication bias.

86. Adherence to Recommendations for Prehospital Cardiac Arrest Care Across an EMS System of Care: How Well Are We Implementing Guidelines?
Jonathan Kamrud, Lori Boland, Andrew Stevens, Jessica Jeruzal, Charles Lick, Allina Health Emergency Medical Services Category of Submission: Cardiac

Background: To evaluate adherence to American Heart Association (AHA) recommendations for optimal care for out-of-hospital cardiac arrest (OHCA) across the spectrum of prehospital care by analyzing care rendered by bystanders, dispatchers, first responders (FR), and emergency medical services (EMS) provider care. Methods: A total of 294 OHCA events treated by a single ambulance service in Minnesota in 2014–2015 occurred before ambulance arrival in adult patients with witnessed cardiac arrest and had complete data available for bystander, dispatcher, first responder, and EMS care elements. An adherence index (AI, range = 0 to 6) was calculated based on successful delivery of six care elements aligned with AHA recommendations: dispatcher provided instructions for CPR when necessary, FR initiated chest compressions (pre-ambulance CPR), bystander or FR placed an AED (pre-ambulance AED), compression fraction during EMS CPR > 0.8, compression rate during EMS CPR of 100–120/minute, and number of pauses >10 sec in duration during EMS CPR was < 3. Only the first 10 minutes of compressions were considered for EMS CPR criteria. Data sources included audio recordings of dispatch calls, the Cardiac Arrest Registry to Enhance Survival (CARES) registry data, and transthoracic impedance data. Results: The Adherence Index (AI) was calculated and met inclusion criteria for PDE use in the current protocol. We compared pretreatment characteristics and vital signs for patients following out-of-hospital cardiac arrest (OHCA) patients (n = 228). The number of events with AI ≥ 5 increased from 70% among 2014 cases to 83% among 2015 cases (p = 0.009). Conclusions: Adherence to individual guidelines was generally high: dispatcher instructions for CPR = 100%, pre-ambulance CPR = 93%, pre-ambulance AED = 72%, compression fraction = 84%, compression rate = 91%, and number of pauses > 10 sec = 3 = 81%. Care was delivered in accordance with all six criteria (AI ≥ 6) in 52% of events (n = 113) and the AI > 5 in 78% of events (n = 228). Although the dispatcher’s recognition rate of OHCA was not different across the community CPR awareness level, dispatchers provided more CPR instruction in communities with higher CPR awareness level. Finally, more bystanders CPR was provided in patients in higher CPR awareness communities.

87. Recognition of Out-of-Hospital Cardiac Arrest during Emergency Calls by Community Level Public Awareness of Cardiopulmonary Resuscitation: A Multi-Level Analysis
Sun Young Lee, Young Sun Ro, Sang Do Shin, Kyoun Jung Song, Ki Jeong Hong, Young Sun Ro, Soyeon Kong, Tae Han Kim, Seoul National University Hospital Category of Submission: Cardiac

Background: Bystander cardiopulmonary resuscitation (CPR) is a key factor to improve survival outcomes in out-of-hospital cardiac arrest (OHCA). The community alert system for trained citizens was implemented to increase bystander CPR in the community. This study aimed to determine whether the treatment of profound hypotension in the prehospital hypotension from January 2015 to April 2017. We reviewed prehospital and in-hospital medical records for patients treated and not treated with PDE. We compared PDE treatment with crystalloid compared to patients not receiving PDE possibly indicating a selection or indication bias.
Background: Anaphylaxis is an acute, life-threatening condition that requires immediate recognition and treatment. The goal of therapy should be to prevent progression to life-threatening respiratory compromise or cardiovascular collapse. More prehospital providers and school nurses are being instructed in using epinephrine. We sought to determine how often epinephrine is used in children and, more importantly, how often providers, parents, and school nurses are being instructed in using epinephrine. We sought to determine how often epinephrine is used in children and, more importantly, how often providers, parents, and school nurses are being instructed in using epinephrine.

Methods: Setting: A suburban two-tiered EMS system in which ALS units evaluate approximately 10,000 patients per year. Subjects: Patients under 13 years old who sustained POHCA with resuscitation attempt without return of spontaneous circulatory activity. The percent of patients who received appropriate treatment was 62% (CI: 56–66%). Of the inappropriate treatments, epinephrine was given inappropriately 30% (CI: 24–35%) of the time, increasing the need for prehospital treatment 9% (CI: 5–12%) of the time.

Conclusions: Despite increasing incidence and public awareness of life-threatening allergic reactions, both the prescribing and use of epinephrine remains suboptimal. epicardial defibrillation was not performed in 50% (CI: 44–55) of the patients prior to EMS arrival, and 10% (CI: 6–13) by ALS personnel. The percentage of patients who received appropriate treatment was 59% (CI: 54–65) of these patients received epinephrine 49% (CI: 44–55) prior to EMS arrival and, 10% (CI: 6–13) by ALS personnel. The percentage of patients who received appropriate treatment was 59% (CI: 54–65) of these patients received epinephrine 49% (CI: 44–55) prior to EMS arrival and, 10% (CI: 6–13) by ALS personnel.

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 different interventions from 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 <18 years old who sustained POHCA with resuscitation attempt without return of spontaneous circulatory (ROSC) before EMS arrival between 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 compared and evaluated at baseline and post-implementation groups.

Results: A total of 132 POHCA patients were identified, of whom 24 survived to hospital admission prior to EMS arrival. The remaining 108 patients had average age of 1.61 years, with similar baseline characteristics between groups. In the two years prior to implementation, 13 had ROSC after EMS arrival and none survived to hospital admission. In the three years after implementation, 13 had ROSC after EMS arrival and none survived to hospital admission. The control group, there were 37 cardiac arrests. Of these, two 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 significantly. The findings are consistent with recent pediatric literature and support the use of pediatric-specific tools for the management of pediatric cardiac arrest.

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

Octavio Perez, Octavio Perez, Eric Helfenbein, Bruce Barnhart, Saeed Babaezadeh, Dawn Jorgensen, Chengcheng Hu, Valsal Chikani, Joshua Garth, Sammuel Sam, Ed Fink, Craig Oliver, Daniel Spalte, 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 assessment is largely 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 Barell Matrix 1) in the EMTS EMS 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 which a pre-hospital 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 value. 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 responsibil- ities 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 stud- ies should be conducted. Wherever possible, quality improvement and research projects should utilize monitor data to iden- tify and evaluate hypotensive TBI patients. Future research should investigate if 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, Chris- tine Hamilton, Ashish Panchal, Department of EM, The Ohio State University Wexner Medical Center 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. 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 our study was to evaluate the proportion of females who earned initial National EMS Certification and paramedic certification among all licensed EMS professionals, however barriers for the lack of change in the paramedic gender composition of those earning National EMS Certification.

89. IMPACT OF COMMUNITY PARAMEDIC HOME ASSESSMENT OF HEART FAILURE ON QUALITY OF LIFE

Sandi Wewerka, Joseph Pasquarella, Ann Majerus, Aaron Burnette, Matthew Simpson, Paula Miller, Regions Hospital Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: Effective management of congestive heart failure (CHF) often requires patients to make significant lifestyle changes, which may be best managed in partnership with the patient’s healthcare team. 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 question- naire that uses a Likert scale to measure the effects of CHF symptoms, functional limita- tions and psychological distress. Each symp- tom 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. 4–6 weeks after discharge, patients completed the pre- and post-surveys.

Results: Twenty-three patients completed the pre- and post-surveys 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 = 8.57) while on the post-assessment it was 9.96 (SD = 8.84). Total scores were significantly dif- ferent 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 = 0.111).

Conclusions: Using the MLHF, we showed significant improve- ment in QOL of CHF patients who completed the CP program. This study is limited by the small sample size but the data encourage encourag- ing improvements to this patient population.

96. SEATBELT USE BY AMBULANCE PERSONNEL IN THE PATIENT COMPARTMENT IS LOW REGARDLESS OF PATIENT PRESENCE, SEATING POSITION, OR PATIENT ACUITY

Rebecca Cash, Evan Crowe, Remle Crowe, Madison Rivard, Anne Knorr, Ashish Panchal, Douglas Kupas, National EMS Certification, Triangle Tech, The Ohio State University Wexner Medical Center Category of Submission: Operations, Quality, Safety Systems, Disaster, Disaster

Background: Recent crash testing shows EMS professionals are at high risk of injury on 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 pres- ence 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 higher in non-military service who work in ambulances. We defined consistent seatbelt use as reporting frequency of use >50% of the time in a seating location. Denominators represent respondents reporting using 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 reported wearing a seatbelt in the ambulance (97%, n = 1,181/1,221). In the patient compartment without a patient being transported, consistent seatbelt use was poor regardless of seat position. Male paramedics 60–69 yrs (n = 49/82), rear-facing airway/jump seat: 59% (n = 670/1,136), crew bench: 36% (n = 362/997). 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 (25,410–60–9) and EMT provider level (2.39,1.52–3.78 [referent: 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.

97. FEASIBILITY OF MANUAL ACTIVE COMPRESSION DECOMPRESSION CPR IN A THIRTY-DEGREE HEAD UP POSITION

Heather Ellis, David Chase, Ventura City 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 peri- and chronic cardiac arrest. A randomized controlled trial in CPR with ITD in HUP has shown mixed results. There is controversy regarding the ability to perform high quality manual ACD CPR in HUP, compared to the High quality manual ACD CPR in HUP to specific head up position.

Methods: A recording simulation mannequin was placed in HUP. After brief instruction and practice using the Zoll ResQPRITM
system continuous ACD CPR was started by a three-member first response team. The compression rate of the mannequin at 100 compressions per minute was a high-quality CPR. Zoll recommends a rate of 80/minute for this system. After completion of 15–20 minutes of simulated manual ACD HUP CPR the team members were required 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 recorded. Mean (SD; CRP) rate was 78.1 (6.9; 75.6–80.6) in minutes and mean depth was 2.16 (0.07; 2.14–2.19) inches. Thirty separate 200 compression efforts were analyzed for beat-to-beat compliance for depth and decompression. Mean depth compliance was 76.8% (6.08%; 75.8–81.3%). Mean decompression compliance was 91.4% (1.1%; 88.0–94.8%). 10 of 10 studies reviewed met the AHA guidelines of high quality manual ACD CPR as being more fatigue than standard CPR and 9 of 10 described muscle strain. Discussion: Beat-to-beat % depth compliance fell just short of the benchmark set. All other defined benchmarks were met. The authors anticipate that with more instruction and practice the beat-to-beat depth compliance of 80% would be achieved. Continuous quality manual ACD HUP CPR can be done; however, it is more fatiguing and causes more muscle strain than standard CPR.

98. Television and Film Depict Unrealistic Rates of Cardiac Arrest Survival

Johanna Innes, Brian Clemency, Maxwell Didams, Peter Natalzia, Deborah Waldrop. University at Buffalo Category of Submission: Cardiac

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 rate of cardiac arrest 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.

Methods: We conducted a meta-analysis of existing studies of cardiac arrest resuscitations depicted on television and film. A PubMed search was conducted using the following search terms: “cardiopulmonary resuscitation and television,” or “resuscitation and television,” or “heart arrest management and outcomes may shape public perception of a cardiac arrest victim’s chance of survival. We sought to determine the rate of cardiac arrest 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. We searched the PubMed database for studies that included cardiac arrest patients where resuscitation was considered. Patients were included in the study if the title of the study contained the terms “cardiac arrest,” “resuscitation,” or “survival.” Two reviewers independently reviewed all studies. Studies that included survival data from in-hospital and out-of-hospital cardiac arrest patients depicted on television or in movies were included in the analysis. Subject demographics, rates of return of spontaneous circulation (ROSC), and survival to discharge were reviewed and compared to published data from the CARES Registry. The CARES Registry contains details of OHCA patients, including age, gender, initial blood glucose, and outcome (no ROSC vs. ROSC). We used a χ² test to analyze categorical variables. Results: The initial PubMed search yielded 260 unique references. There were 412 resuscitation attempts among 552 cardiac arrest patients, from 8 studies which met the inclusion criteria. The primary outcome of interest was ROSC. Of the 552 cardiac arrest patients, 438 patients had ROSC, for an ROSC rate of 79%. In the 2016 period, 134 cardiac arrest calls were identified from a total of 27,572 EMS calls. Thirty-nine patients achieved ROSC with 8 surviving to discharge. Seven of the 59 patients survived to be discharged with no documented neurological deficits. Conclusions: The media’s depiction of cardiac arrest survival often does not include survival to discharge information. When television and film studies are 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.


Jeffrey Jarvis, Dustin Barton, Lauren Sager, Nick Nudell, Williamson County EMS Category 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 detrimental impact of the effectiveness of priority dispatch triage for better triage of RLS responses. Little data has been published which defines the prevalence of RLS use today. We sought to describe the proportion of RLS responses using a national dataset.

Methods: Using an electronic review of 61/2 years of data from 9-1-1 consenting agencies using ESO’s Electronic Health Record (EHR) system, we identified the transport mode of all responses to and from the scene of a 9-1-1 call that resulted in transportation of a proportion of calls by 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 a patient transport. Of these, 5,846,038 (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. While we are able to assess the necessity of such response, previous studies have demonstrated a prevalence of high-acuity 9-1-1 calls, it is possible that the 76% of RLS responses to 9-1-1 scenes could safely be decreased with appropriate priority dispatch processes and further reduction of emergency response agency capacity. Further efforts using patient outcome should assess the necessity of RLS response from the scene.

100. Usefulness of Epinephrine in Cardiac Arrest

James Hehl, Matthew Wells, Beth Langley, JE Winslow, Cape Fear Valley Mobile Integrated Healthcare Cumberland County EMS Category 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 have shown that IV administration of epinephrine may impede neurological recovery. Therefore, our EMS agency developed a “one dose epinephrine” prehospital protocol for medical cardiac arrest improvement project. 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 every 3–5 minutes; to February through July 2017, with epinephrine administered once.

Evidence of neurological status was obtained from the physician discharge summary in the patient’s medical record. Results: In the 2016 period, 134 cardiac arrest calls were identified from a total of 27,782 EMS calls. Thirty-three patients achieved ROSC with 10 surviving to discharge. This was substantially higher than the out of hospital cardiac arrest survival rate reported in literature (P < 0.001).

Conclusions: The media’s depiction of cardiac arrest survival often does not include survival to discharge information. When television and film studies are 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.

101. Association between Initial Blood Glucose in Out-of-Hospital Cardiac Arrest and Return of Spontaneous Circulation

Caitlin Howard, Hattie McAvinney, David Wampler, Jeremy Allen, Justin Smith, David Miramontes, Joan Polk. United States Army, L UTHSCSA Category of Submission: Student, Resident, Fellow

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 the rate of ROSC and return of spontaneous circulation (ROSC). Methods: This was a retrospective review of a registry containing details of each resuscitation attempt by a large, urban, fire-based EMS agency. Inclusion criteria for OHCA cases were age 18 years and older, a cardiac origin of arrest, a documented neurological status. Data from January 1, 2016 through August 16, 2016 was analyzed. Patients were included in the study if the following variables were available: age, gender, initial blood glucose, and outcome (no ROSC vs. ROSC). Patients were excluded if age < 17, no age, gender, or initial blood glucose recorded, multiple blood glucose crossings 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 365 males (62.10%). 452 patients (73.0%) had initial blood glucose < 200 and 167 patients (26.94%) had a glucose level > 200. Of the patients with glucose < 200, 171 (37.75%) obtained ROSC. Of the patients with glucose ≥ 200, 63 (37.72%) obtained ROSC. There was no association between blood glucose levels and achievement of ROSC (P = 0.10). Conclusions: We found no significant association between initial blood glucose levels in OHCA patients and likelihood of achieving ROSC. The main
limitation to this study was that the patient population was restricted to San Antonio, Texas. 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 Tatara, Joseph Cordova, Kenneth Pearlman, Eddie Majid, Matthew Shizzi, Mark H. E. Yeung, Eszter Zun, Northwestern Feinberg SOM Department of Emergency Medicine and Center for Outcomes Studies, Chicago, Illinois

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 psychotropic disturbances and intoxication. However, limited data exist regarding midazolam use in the prehospital setting. We describe our experience after implementing a protocol for treating patients with behavioral emergencies using midazolam in a large urban EMS system. Hypothesis: 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 emergency 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. A total of 452 medical EMS records were identified.

Results: In medical OHCA, incidence of ROSC during resuscitation increased from 41% (185/452) to 46% (220/482) with implementation of a TOR protocol using midazolam at hospital arrival increased from 35% (160/452) to 40% (191/482). There was also a significant (p < 0.001) increase in mean duration of resuscitation from 24 minutes (range 13 to 15 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 midazolam 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

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.

Methods: We conducted a single case study to evaluate an expert-panel developed training program for community paramedics serving as CTI coaches who support the ED-to-home transition.

Results: This study is a component of an ongoing two-center randomized controlled trial evaluating a community paramedic-implemented CTI to enhance the ED-to-home transition. Community paramedic training covered multiple domains including the CTI program, geriatrics, motivational interviewing, ED discharge, and community health. 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 women and all were non-Hispanic whites. The mean age was 50 years. Participants had diverse backgrounds in healthcare, primarily as EMS providers, but minimal experience with community paramedicine. All reported some prior experience implementing CTI protocols. 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 CTI. Training that leads to the active and integrative acquisition of knowledge, skills, and attitudes is critical for effective implementation, including choosing the optimal candidate coaches, delivering training in the most effective format for students, and delivering content targeted to student needs.

105. EMERGENCY MEDICAL SERVICES RESPONSE TO MASS SHOOTING AND ACTIVE SHOOTER INCIDENTS, UNITED STATES, 2014–2015

Matthew Szajnkrycer, Aaron Klassen, Morgan Marshall, Mengtai Dia, N Clay Morgan, Mayo Clinic Department of Emergency Medicine

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 incidents were obtained from the open source Gun Violence Archive and then correlated with NEMSIS data to identify active shooter incidents identified through FBI data. A de-identified database was generated for final analysis. Results: A total of 608 mass shooting events 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 EMS (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 included extremities (38%), chest (9%), and head (9%). Tourniquet use was documented in 6 victims. Gunshot wound was self-inflicted in 5 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 tourniquets in future documented EMS tourniquet use was uncommon. While mass shooting events pose high risk for responders, dispatch information was lacking in 9% of records. Regionally, 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 Transport 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 transport issue. 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.

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 23 questions inquiring about K9 trans-ports, policies and procedures was emailed to up to 295 identified programs. Results: We received 147 total survey responses (49.8% response).

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 the survey was to quantify the number of transports for injured operational K9s and to 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 ED, Parkland/UMN 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 2014. Program goals included improving hospital utilization and reducing readmissions through a unique Community Paramedic (CP) partnership. Hypothesis: Patients with congestive heart failure who were discharged for 30 days post discharge have a reduced rate of readmis-sion and an increased use of clinic visits. Methods: Inpatients with CHF who were visited by a CP within 7 days of discharge. 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 developed a follow-up care plan and care 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 comparision of 90-day healthcare utilization pre- and post-admission showed that patients who were provided CP services had a significant decrease in hospital readmissions (p = 0.001) and ED visits (62%, p < 0.0001), and had a 14% increase in clinic visits (ns, p = 0.45). A group of patients that met inclusion criteria but declined consent to participate was compared to the intervention group, and the patient group 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 = 0.0009) pre- to post-hospitalization than those who did not enroll (n = 20). There was no significant difference in change in clinic utilization. Conclusions: Partnership between CP-based EMS and hospitals for Community Paramedic pro-grams can be successful. CP’s providing post-discharge care of healthcare utilization toward reduced admissions/ED vis-its and increased clinic visits. Further research with a larger cohort is needed to determine if utilization patterns would be sustained past 90 days.

108. “PDTree”: Development of a New Pediatric Prehospital Transport Destination EBG

Jennifer Fishe, Kye Fratta, Jennifer Anders, 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 destination transport EBG. Methods: A systematic literature search identified articles pertinent to non-trauma pediatric prehospital destination choice. Resulting articles were reviewed using GRADE and compiled into an evidence profile. An expert panel of CP and stakeholders from pediatric EM, ED, EMS medical direc-tors, EMS providers, and patient/family advoca-tes reviewed the evidence profile and data from the statewide EMS system where the EBG would ultimately be tested. The Delphi process had three voting rounds and 75% agreement threshold, the panel selected items for the EBG and defined their clinical utility, and reached consensus on a pediatric prehospi-tal transport destination EBG. Results: The literature search produced 60 articles. After GRADE quality assessment, 54 articles were included in the evidence profile. Articles identified specific pediatric populations (ALTE, seizures, special

health care needs) at risk for secondary trans-port or interfacility transport (IFT). IFT decisions are made quickly, but patients risk sub-optimal pre-transfer care, and suffer delays in definitive care and increased morbidity. Quan-titative physiologic data (vital signs, capillary refill, observation) is provided on hospital-based systems in isolation do not accurately or reliably predict the need for pediatric specialty/critical care. Combining quantitative and qualitative prehospital assessments promises to increase the rate, reliable prediction of specialty/critical care needs. After reviewing the evidence, the expert panel’s modified-Delphi process pro-duced a pediatric-hospital-based destination EBG (“PDTree”). The PDTree is formatted as an algorithm, matching 14 non-trauma conditions/risk factors (including ALTE, seizure requiring EMS-administered benzodiazepine, sepsis, and emergency resources to treat at a medical home) to three different levels of pediatric care (specialty, compre-hensive, regional). Conclusions: Existing med-ical literature identifies the need for prehos-pital transport destination guidance for non-trauma pediatric patients. That evidence sup-porting the modified-Delphi process was used to pro-duced the “PDTree”, a new non-trauma pediatric prehospital destination EBG. “PDTree” will be pilot tested by computerized resource modeling, prehospital transport personnel, 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 Anders, 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 defini-tive care and burdens the patient with poten-tially 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 proc-edures and charges for pediatric patients undergoing IFT for pediatric admission after an ED visit to a different facility. Methods: This study utilized three years (2010–2012) from Maryland Primary Care Clinic Network (PCCN) data. A modified probabilistic linkage was per-formed to identify ED patients who were dis-positioned to IFT and admitted to a distant facility. Included patients were 0–17 years of age with any of the 20 most Common Diag-nosis Categories (DxC) and whose conditions were classified “emergent” or “urgent”. After linkage, duplicate procedures were identified and classified as administrative or clinical. Mul-tiple regression analysis was used to com-pare the average total charges of IFT patients, including duplicate charges, to non-IFT admit-ted patients presenting with the same top 20 DxC. Results: Of the 9,447 IFT inpatients identified, 2,254 patients were successfully linked, of which 1,713 (76%) had one of the top 20 DxC. The most frequent administrative duplic-ate 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 aver-age additional charge of $1,728, excluding aver-age duplicate charge of $1,627.84. In compari-son, the average charge incurred by a non-IFT was $8,209.72. Adjusting for the effect of age, gender, and race, and using a model that estimated an average 34% (30.1–37.6%, p < 0.001) increase in total charges for an IFT patient
compared to a non-IFT patient. Conclusions: Both safety harms (radiation exposure) and significant costs have been incurred in the delivery of IO to patients undergoing IFT from an ED for inpa-
tient admission to a distant facility. EMS sys-
tems can minimize this inefficiency and burden by developing policies to definitive care facil-
ities whenever feasible.

110. CLINICAL EVENTS IN PREHOSPITAL PATIENTS WITH ST-抬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 Tanguy, Jean-Michel Paradis, Denise Hébert, Richard Fleet, Département de médecine d’urgence – Université Laval

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 transferred in ambulance over long distances are at risk of suffering from clinical events such as bradycardia or hypotension. The objective of this study was to establish clinical events, and to determine if the complications occurring in the presence of BLS paramedics are influenced by the transporta-
tion time. Methods: In a retrospective cohort study, we reviewed 896 consecutive STEMI patients diverted and transported to the near-
est PCI-capable center according to an emergen-
cy physician’s interpretation of a 12-lead ECG transmitted by paramedics. Patients had continu-
ous electrocardiogram (ECG) and vital signs monitoring during transport. A focus group composed of established clinically important and minor events based on liter-
ature search. A multivariate ordinal logistic regression model was used to study the association 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 12.2% of the STEMI patients, respectively. Transporta-
tion time was not associated with higher risk of suffering from clinical events (p = 0.182). The most frequent events were bradycard-
 ia (28%), hypotension (23%), asystole (12.5%), ventricular tachycardia / ventricular fibril-
lation (VT/VF) (5.13%). All patients suffering 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-lead 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 INTRAOSSEOUS NEEDLE PLACEMENT BY EMS PROVIDERS

Steven Sommerville, Daniel Wilner, David Schoenfeld, Beth Israel Deaconess Medical Center

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-
romuscular blocking agent is used, and relatively 
slow intubation. The extent to which DAI is incor-
porated in statewide treatment protocols (STP) has not been described. The majority of stateshave 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 variabil-
ty in pharmacopeia utilized. Methods: Cross-
sectional study of STP utilizing a standardized review of STP and standardized protocols. 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 majority (71%) of STPs. 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 drug-assisted intubation recommends 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-

tial 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-
can be used to provide quick delivery of various medications. In particular, in cases in which venous access is compro-
mised; however, if done incorrectly, it can lead to unwanted complications such as extra-
avasation of fluid, poor flow, and catheter dislodge-
ment (Paxon 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-
ultaneously insert an IO needle at both the tibia and humerus. These gaps persisted after the imple-
mentation of an educational intervention. Other
classifications included education on anaphylaxis diagno-
sis, recognition, treatment priorities, and feed-
back on the recognition and management from

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Rakesh Gupta, Krystyna Samoraj, Simperpreet Sandhanwalia, Matt Kerslake, Luke Ryan, Colleen Shortt, Michelle Welford, McMaster University Category of Submission: Student, Resident, Fellow

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 is needed. The aim of this study was to compare the proportion of cases of anaphylaxis appropri-
teately treated with epinephrine by paramedics before and after a targeted educational in-
vention. 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 educa-
tional module was introduced. This mod-
ule included education on anaphylaxis diagno-
sis, recognition, treatment priorities, and feed-
back 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 303/408 in the after period met criteria for anaphylaxis (p = 0.002). Of the cases meeting anaphylaxis criteria, 77/99 (77.8%) in the before and 88/136 (64.7%) in the after period were correctly identified as anaphylaxis (p = 0.046). Epinephrine was administered in 37/63 (57.1%) of anaphylaxis cases in the before period and 76/136 (55.9%) in the after period (p = 0.70). Anaphylactic patients with only 

tests using 0 as the standard landmark. The average distance from the landmark on the humerus was 5.06 cm and 5.03 cm on the tibia. The average from the tibia was 4.13 cm (95% CI: 3.16–5.10). 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

Mirinda Gormley, Juan Lu, Virginia Commo-
wealth University Category of Submission: Medical
Background: Emergency medical services (EMS) personnel deliver Naloxone to reverse drug overdoses. However, EMS personnel may experience challenges with patient care, including being unable to convince a patient to be transported to the hospital. Without knowing the appropriate follow-up care for these patients could overdose again. Objective: Identify characteristics associated with patients who received Naloxone from EMS but refused transport to the hospital.

Methods: Data came from the 2015 National Emergency Medical Services Information System. The incident/patient disposition was used to create a binary outcome (“transported” or “refused”), where “treated, transferred care,” “treated, transported by EMS,” and “treated, transported by Law Enforcement” made up “transported,” and “no transport 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 Naloxone uses by personnel at a transport unit during a 9-1-1 response. After treatment, 1.6% of patients refused transport. These patients were primarily male (65.0%), white (76.8%), and had a median age of 48 (IQR 32–61). Compared to transported patients, those who refused were more likely to be found in a residence (75.6% vs. 68.0%), or receive aid prior to EMS arrival (60.3% vs. 23.9%). Larger proportions of patients to the hospital if found in a public location (19.7% vs. 13.5%), or a rural/wilderness area (10.4% vs. 6.6%). Patients had nearly double the odds of being transported from a public location rather than a residence (OR = 1.704, 95% CI = 1.58–1.84), and nearly triple the odds of being transported from a rural location (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 without challenges and treatments are given. EMS Compass is a national organization that has developed several clinical measures. No work has been done to benchmark the implementation of these measures and the accuracy of the National EMS Dataset. This is necessary for quality improvement efforts and refinement of the measures themselves. We aimed to describe compliance with Naloxone use in a large EMS data collection. Methods: Using a 6% sample of 9-1-1 consenting EMS agencies using the ESO electronic health record (EHR), we calculated the compliance among transported 1-1 patients for the following measures: (1) some type of glucose given to those with blood glucose <60, (2) a blood glucose documented for those felt to be in status epilepticus, and (3) a benzodiazepine given for those felt to be in status epilepticus. For measures requiring administration of a medication, only ALS personnel were included. We measured a binary outcome (“measured” or “measured”). Confidence Interval were calculated. Results: A total of 147,238 patients had a documented blood glucose <60. Of these, 117,358 (79.7%) had 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%, 51.5–60.6%) had some type of benzodiazepine given by ALS agencies. Conclusions: We describe the compliance rates on several EMS Compass measures using a national cohort. There were no significant differences in mean CWT at the midclavicular line, and at the 4th intercostal space (56.1%, 51.5–60.6%) and at the 2nd intercostal space (56.1%, 51.5–60.6%) had 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%, 51.5–60.6%) had some type of benzodiazepine given by ALS agencies. Conclusions: We describe the compliance rates on several EMS Compass measures using a national cohort. The 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 (AFIRE)

Timothy Burns, Alan Butsch, Cristopher 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 more difficult. Purpose: To explore whether or not EMS medications deployed in modern fire and EMS vehicles experience temperatures that are outside storage temperatures 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 data management platform, a continuous stream of temperature data for the entire study period. Results: Data from the paramedic engine location reveals that the temperatures vary from the “cold” storage temperature range (1.5°C–4°C) to the “hot” storage temperature range (30°C–37°C). During the summer, the environment was much warmer. In the summer, transport engines were in the “controlled room temperature” range 89229 minutes (94%) and 60168 minutes (64%) of the study period, and 2694 minutes (3%) of the study period were out of the “warm” storage temperature range 894620-minute study period, in the range “warm” (86–104°F) for 60168 minutes (64%) of the study period, and out of the “controlled room temperature” range 89229 minutes (94%). Neither position in the transport unit was subjected to “extreme heat,” but they were in the “warm” range for 5759 minutes (6%) and 12092 minutes (13%) respectively, during the study period. Transport units were outside the controlled temperature range for 51338 minutes (54%) and 67131 minutes (71%). Conclusions: Temperature is much more variable than previously thought. Poor compliance with medication storage guidelines is a function of poor, non-standard documentation, inaccurate measurements, or poor clinical performance. In any case, these results identify opportunities for important system improvement.

117. EPIDEMIOLOGY AND OUTCOMES OF ANAPHYLAXIS-ASSOCIATED OUT-OF-HOSPITAL CARDIAC ARREST

Seung Chul Lee, Sun Young Lee, Sang Do Shin, Jeong Ho Park, Dongguk University Ilsan Hospital

Category of Submission: Cardiac

Background: Understanding the epidemiologic characteristics of anaphylaxis-associated out-of-hospital cardiac arrest (OHCAs) is the first step for developing preventative strategies and optimizing care systems. We aimed to describe and compare the epidemiologic features and outcomes among patients with anaphylaxis-associated OHCAs according to causative agents group. Methods: We identified emergency medical service (EMS)-treated anaphylaxis-associated OHCAs patients from a nationwide OHCAs registry between 2008 and 2015. We compared epidemiologic characteristics and outcomes according to the causal agents and evaluated temporal variability in anaphylaxis-associated OHCAs incidence. The rate of survival to discharge was compared among causative agents groups using multivariate logistic regression analysis. Results: During the study period (8 years), a total of 224 anaphylaxis-associated OHCAs were included in analysis. Anaphylaxis with peeling insect sting and food reactions represented 32 (14.3%). There was significant variability in the frequency of anaphylaxis-associated OHCAs per hour of the day (p value < 0.01) and season of the year (p value < 0.01), with the highest incidence occurring during the day-time (7:01 am to 3 pm) in spring (June to August, 48.7%). Compared with natural agents, the adjusted odds ratios (AORs) for survival to discharge in iatrogenic agents were statistically significant (AORs 3.61 to 5.5, 95% CIs 0.86 to 15.06). Conclusions: There was significant temporal variability in the incidence of anaphylaxis-associated OHCAs, with its peak during the summer. Survival to discharge among iatrogenic OHCAs by natural agents accounted for the greater proportion of anaphylaxis than iatrogenic agents but there was no difference in survival to discharge between the two groups.
associated with an adjusted odds ratio of 13.8 (Confidence interval 4.5–39.8) for failure with a standard 5cm catheter needle decomposition. Based on the significant difference in failure rate and the importance of identifying a method to avoid failure, we developed a protocol for needle decomposition. A paired t-test, with p = 0.01). All PS agreed the module was of value and would be useful in everyday practice.

Conclusions: In the increasingly obese general population, needle thoracostomy with a standard 5cm needle may be more prone to failure. The use of alternative needles, such as a 5ml syringe or a 3ml catheter needle, may reduce the risk of failure. Providing additional training on needle decomposition to providers can improve success rates and reduce potential complications.

119. EVALUATING THE INCORPORATION OF A JOURNAL CLUB SERIES INTO PARAMEDIC INITIAL EDUCATION

Lauren Maloney, Paul Werfel, Robert Marshall, Scott Johnson, Stony Brook University Department of Emergency Medicine Category or 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 science of evidence-based medicine. We then compared the perception of PS who attended journal clubs for their continuing education (p = 0.01). All PS agreed the module was of value and would be useful in everyday practice.

Conclusions: In the increasingly obese general population, needle thoracostomy with a standard 5cm needle may be more prone to failure. The use of alternative needles, such as a 5ml syringe or a 3ml catheter needle, may reduce the risk of failure. Providing additional training on needle decomposition to providers can improve success rates and reduce potential complications.

120. DOUBLE-SEQUENTIAL DEFIBRILLATION: EFFICACY AND RISK OF DEFIBRILLATOR DAMAGE ARE HIGHLY CONTINGENT UPON THE CHOICE OF SHOCK TIMING AND SHOCK VECTORS

Tyson Taylor, Sharon Melnick, Fred Chapman, Gregory Walcott, Physio-Control, Inc. Category or 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 hypoth-
123. I Love My Community Paramedic: Patients Report Overwhelming Satisfaction with Community Paramedic Program

Tia Radant, Paula Miller, Joseph Pasquarella, Ann Majerus, Jennifer Murphee, 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 Program (CPM) is an emerging profession and as such 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 visited the patient in the home 1–2 times per week for 4 weeks following discharge. 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.” Means from the Likert scale were analyzed and are reported descriptively. Results: A total of 59 patients completed surveys regarding their satisfaction with the 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), 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 that they were here the first day that I was in the hospital.” When we got out of the hospital I was just so messed up, I had all these drugs and stuff, and she went through them and got everything worked out. It made a whole lot of difference so overwhelmingly a good time.” 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: A Pilot for Emergency Medicine Residents (EMRS)

Jeffrey Luk, Cristina Carpintero, Stephanie Gaines, Amy Pound, University Hospitals Cleveland Medical Center/CWRU School of Medicine Category of Submission: Operations, Quality, Safety Systems, Disaster

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 compare the 4 different comprehensive PMC curriculums for EMRS. Methods: Setting: Tertiary academic medical center. Participants: EMRS. Design: Subjects were taught PMC in phases consisting of (1) lecture; (2) review of PMC calls; 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), referral of medical assistance (RMA), and field termination (FT) along with familiarity of protocols (FP) and phase usefulness (PU). Likert scores for these categories were compared among phases using the t-test and Mann-Whitney test, respectively, with statistical significance set at p < 0.05. 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. Results: Statistically significant differences were found in all comparisons, except for FP, FT, 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 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 benefit 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 group of 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 with Full Return of Spontaneous Circulation

Jeong Ho Park, Yu Jin Kim, Young Sun Ro, Soha 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: Cardiac

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 mitigated by early reperfusion efforts at the scene are insufficient. The aim of this study was to determine the association between the transport time interval (TTI) and neurologic outcome in patients with 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 censored at 90 s (1–5 min), intermediate (6–10 min), and long (> 11 min). The primary outcome was neurologic neurological recovery at discharge (cerebral performance category 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 74% 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. The adjusted odds ratio (aORs) [95% confidence interval (CI)] of TTI for good neurological recovery was 0.58 (0.37–0.92) for short TTI, 0.60 (0.39–1.01) for intermediate TTI, and 0.30 (0.21–0.41) for long TTI. 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 ≥6–10 min STI group. Conclusions: A longer TTI adversely affected the likelihood of good neurologic 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 Kozicky, Dana Dalarno, Stacy Goulder, Suzanne Snozyk, Karen Leaman, Susan Biesbrook, 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 Aleris 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 consecutive sample of patients requiring blood analysis. The difference of proportion of discrepant results between POCT and laboratory was compared using a two sample proportion test. POCT results were analyzed by survey of CP experience, linear mixed effects model of Systems Usability Scale (SUS) adjusted for experience, expert heuristic evaluation of devices, device-related errors, and coded observations of quality control testing. Results: Of 1,699 study period patient care events, 174 had a blood draw, with 108 events (62%) enrolled from 73 participants. Participants had a mean age of 58.7 years (SD163); 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 = 0.32). 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 (3.1%; 95% CI 1.6%, 4.6%) compared to i-STAT (1.8% 95% CI 1.3% 2.3%). 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 = 0.007). Eighteen of 19 CP surveys were returned, with 11/18 (61.1%) preferring i-STAT, 4/18 (22.2%) preferring i-STAT, and 3/18 (16.7%) finding 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

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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 few 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 proportion 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. BLS-only responders were 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 = 1,911, 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 grade specific information concerning their reasons for retesting. Future studies will need to focus on the individual characteristics with which whether graduates 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, Kwang Joon Park, Department of Emergency Medicine, Seoul National University Hospital Category of Submission: CARDIAC

Background: Positive association between bystander cardiopulmonary resuscitation and outcomes of out-of-hospital cardiac arrest (OHCA) are reported. There are various differences of sociodemographic and EMS factors between rural areas and urban areas. The aim of this study was to investigate whether the effect of bystander CPR on outcomes after OHCA differed by urbanization level of community.

Methods: This study was a cross-sectional study of OHCA patients who received CPR and/or defibrillation from a single system cardiac arrest registry in Korea. We included adult witnessed OHCA patients with presumed cardiac etiology who received immediate emergency medical care. Bystander CPR categorized into 3 groups: bystander CPR with dispatcher assistance, bystander CPR without dispatcher assistance, and no bystander CPR. Good neurologic recovery at discharge. We compared outcomes between bystander CPR group using multivariable logistic regression with an interaction term between bystander CPR and community urbanization level (Rural vs. Urban). Results: Among 108,253 patients, 53,528 patients were included. 49.1% received bystander CPR (12.8% without dispatcher assistance and 36.3% with dispatcher assistance), and 50.9% received no bystander CPR. Good neurological recovery rate was 5.0% in bystander CPR with dispatcher assistance, 5.5% in bystander CPR without dispatcher assistance, and 2.2% in no bystander CPR group. In the interaction model, the adjusted OR of bystander CPR for good neurological recovery was 2.30 [95% CI: 1.38 (1.17–1.63) without dispatcher assistance and 1.44 (1.48–1.64) with dispatcher assistance] and rural areas [AOR (95% CI): 2.80 (1.33–5.92) without dispatcher assistance and 4.46 (2.38–7.84) with dispatcher assistance]. Conclusions: 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 Category of Submission: MEDICAL

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 may 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 an attempt-to-resuscitate 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, additional 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-only: 4%, ALS-BLS: 1%, p < 0.001). BLS-only response agencies more frequently upgraded to lights and sirens during transport (7%) than ALS-BLS responders. Conclusions: Use of CPAP/BiPAP by EMS agencies with BLS-only response occurred in 2% of cases. BLS-only response agencies 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 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 work 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 Miramontez, Joan Folk, United States Atlantic 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 collected from January 1, 2010 to August 1, 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 18 years or older. Exclusions 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 (32.36%) 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). Conclusions: BMI did not have any effect on the 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 a single system cardiac arrest registry 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 distressing symptoms and improving the quality of life for patients and their carers. Paramedics routinely respond to palliative patients and can assist with symptoms relief. In Nova Scotia, a novel clinical practice guideline 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 formulary with the goal to treat at home if the patient desired. Paramedics comfort with the dose and range of opiates for palliative care is increasing. Our objective was to describe the paramedic medication administration practices for the management of pain and breathlessness.

Methods: We conducted a retrospective review of 100 consecutive palliative care responses from February 1, 2016 to June 30, 2016. An electronic query would fail to cap-
turer assistance with home medications; a manual chart review including standard medication administration, the free-text portion was conducted to fully capture the care provided. Descriptive analysis was conducted and results were reported with n and % or mean and standard deviation (SD). 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 was administered to 35 (35%) patients (40.5%) with no medication. Most common CC was pain; despite this, only 36 (36%) pain patients received treatment and 6 (6.70%) were ketamine. Post-treatment pain scores. Only 12 (44.4%) breathlessness patients received medication. Paramedics assisted with home medication 10 (17.2%), administered from drug kit 45 (77.8%) and both 3 (5.2%). 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 quality improvement tool with inclusion of assistance with home medications, management of pain and breathlessness may not be optimized. Pre- and particularly post-medication pain scores would be underestimated in the contact with 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 Loporcio, David Schulte, Brian Dang, Denver Medical Center/Harvard Medical School Category of Submission: Student, Resident, Fellow

Background: Ketamine was discovered in the 1960s, and since that time has been used for multiple indications including pain control, procedural sedation, induction, depression, and excited delirium/behavioral disturbances. Ketamine has a more favorable hemodynamic profile than many of its alternatives for use in both intravenous and intramuscular routes. The purpose of this investigation is to describe the overall prevalence of ketamine and the indications for which it can be utilized. Methods: Cross sectional study of STPs for inclusion of ketamine in any protocols. Protocol revision date was also captured. Results: Thirty-one out of fifty (62%) states include ketamine for induction during rapid sequence intubation, and five states (16%) allow ketamine for procedural sedation. Six states (19%) include ketamine in their pain control protocols. Eight states (26%) have excised delirium protocols which include the use of ketamine. One state also includes ketamine as an agent for shivering, 60% of states which include ketamine in their protocols only allow its use for one indication. 75% of protocols have been revised since 2015 and all have been revised within the past 5 years. Conclusions: Ketamine has become a versatile medication with a variety of applications in prehospital care. Despite this, less than half of STPs include ketamine in their pain control protocols, and the majority of those that include it have limited indications. Ketamine is a hemodynamically stable option for pain control or induction for RSI, but a minority of STPs include ketamine for these indications. Conclusions: Ketamine has had a recent resurgence in emergency medicine, although as most protocols have been revised in the last 3 years, it is unlikely that protocol revision timing has been a barrier to ketamine adoption into STPs. Further study is needed to examine the barriers to introduction and indication expansion of ketamine in STPs.

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

Andrew Latimer, Sofia Husain, Jonathan Nolan, Vinod Dosrweamy, Thomas Rea, Michael Sayre, Mickey Eisenberg, University of Washington Department of Emergency Medicine Category of Submission: Student, Resident, Fellow

Background: In recent years, the costs of epinephrine autoinjectors (EAIs) in the United States have risen substantially. In 2014, emergency medical services within a large urban/suburban county in the United States implemented the “Check and Inject” program to treat 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 EMIs treating presumed prehospital anaphylaxis or serious allergic reaction. Methods: We conducted a prospective investigation of all cases treated as part of the “Check and Inject” program from July 2014 through December 2016 in the suburban aspects of the County and January 2016 through December 2016 within the major American city located within the county. All cases were prospectively collected using a custom quality improvement data form completed by the first responding EMTs. Two physicians completed a structured review of each EMIs medical record to determine if the EMIs followed the “Check and Inject” protocol and determine if epinephrine was clinically indicated based on physician review. Results: Of the 367 cases for analysis, EMIs followed the protocol appropriately in 367 (89.3%) cases. In the remaining 44 (10.7%) cases, the EMIs incident report form failed to document a clear trigger, an inciting allergic reaction, or an appropriate symptom from the protocol list. Physician review determined that epinephrine was clinically indicated in 36 of the 44 cases. Among the remaining 8 cases (19%) that did not meet protocol criteria and were not clinically indicated based on physician review, none had a documented adverse reaction to the epinephrine. Conclusions: We observed that EMIs successfully implemented the manual “Check and Inject” program for severe allergic reactions and anaphylaxis in a manner that typically agreed with physician review and without any overt identified safety issues.

134. Timely Treatment of Tiny Vomities: The Use of Oral Ondansetron in the Prehospital Environment

Kelly Meehan-Cousseau, Abhijit Srungavaru, John Martel, Michael Bohanske, J. Matthew Sholl, Tania Strout, Maine Medical Center Emergency Medicine Division of EMS, Tufts University Category of Submission: Student, Resident, Fellow

Background: Nausea and vomiting are common emergency department (ED) complaints. While oral rehydration therapy is the preferred treatment modality for dehydration, emesis is a therapeutic barrier. In 2013, Maine’s statewide Emergency Medical Services (EMS) program developed an EMT protocol added oral ondansetron for paramedic administration to children with nausea and vomiting, as unnecessary prehospital intravenous (IV) catheters were associated with discomfort, prolonged scene time and increased cost. Prehospital oral ondansetron administration has not previously been evaluated for clinical endpoints. Our objective was to evaluate the impact of prehospital oral ondansetron administration to pediatric patients on frequency of use, additional interventions, ED length of stay, ED recidivism and ED recidivism. Methods: We conducted a simple interrupted time-series analysis to assess the effect of oral ondansetron availability on study endpoints. Pediatric patients transported via EMS to our tertiary care pediatric referral center ED who received either oral or IV ondansetron in the prehospital setting for nausea or vomiting from 2011–2015 were included. Pre- and post-oral ondansetron protocol implementation groups were compared using chi-square, Fisher’s exact or t-test as appropriate. ED length of stay, ED recidivism and ED recidivism. Results: Data was noted following protocol implementation (0% vs. 47%, p = 0.002). This was associated with a significant decline in the proportion receiving prehospital IVs (100% vs. 65%, p = 0.010) and prehospital IV ondansetron (100% vs. 53%, p = 0.002). Significant changes in other prehospital interventions of the correct adult or pediatric dose of epinephrine autoinjectors (EAIs) in the United States. Many programs exist across the country, attempting to decrease unnecessary prehospital intra-
6 months after the program was completed. Total hours of community paramedic contact time were monitored, and 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 primary contact during the 6 months after completion of the program. August participants saw the least change, where 5 patients who required a total of 51.4 CP work hours saw a decrease from 18 to 13 runs over a 6 month period (−28%). In July there was the largest drop in 9-1-1 usage of 77% (48 to 11), during which time 4 patients were enrolled and 43.8 CP work hours dropped. In 26% of patients were a total of 47 patients enrolled in the program accounting for 337 calls pre-intervention and 149 calls (−56%) 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 by use of 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 REACTS 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 between the type of stress (e.g., work stress, critical incident stress, and safety stress) and the specific outcomes (e.g., errors, adverse events, or injuries and exposures) have not been assessed. There are two types of transactional stress. Internal transactional stresses are associated with the day to day interactions of the paramedic, offsite events, or being placed on standby; dealing with dispatch, inappropriate use of EMS, mandatory over-time, and dealing with frequent service users. External transactional stresses are intertwined with affiliation with professional groups (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 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 with 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 behaviors, and negative safety outcomes (p < .05). Conclusions: These results indicate that there are higher levels of transactional stress in paramedics who endorsed high pathological levels of posttraumatic stress, significant fatigue, and negative safety outcomes. These exploratory analyses indicate that transactional stress in paramedics is related to their work environment, and may provide opportunities addressing posttraumatic stress and negative safety outcomes.

137. PREHOSPITAL AVAILABILITY AND USE OF MEDICATIONS FOR MANAGING HAZMAT EMERGENCIES

Kubwimanwa Mhyamaguru, Amber Bel- laflore, Eric Lederer, Carl Youngs, Robert French, Joshua Burnham, 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 chemical (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, if used, 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 4,560 surveys sent, 784 (18.0%) were completed. Of the completed surveys, 259 (35.6%) paramedics had dedicated hazmat medication kits and 305 (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 340 (44.9%) / 10 (1.2%), calcium gluconate 247 (32.1%) / 26 (3.3%), diazepam 498 (63.5%) / 49 (6.3%), lorazepam 262 (33.4%) / 18 (2.3%), midazolam 619 (79.0%) / 29 (3.7%), and topical lubricating jelly 462 (58.9%) / 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 geographical considerations likely contribute to these results, further work is needed to identify which medications are most 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 Studnek, 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. Falls in this population 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 agreement were calculated for clarity, relevance, and feasibility. The draft assessment tool was deployed for field testing with two paramedics to determine the feasibility and frequency of item identification. Following descriptive analysis and structured interviews, a second field test was conducted with a revised tool. Paired crews completed this assessment independently for sixty patients that entered their home. Pair agreement on the final tool was measured using Cohen’s kappa. Results: A total of 67 items measured extrinsic factors with content validity testing eliminated three items (CVI ≤ 0.76). 22 items were condensed or removed due to redundancy. Round two eliminated another 6 items (CVI ≤ 0.70). Twenty-eight items were included in the final EMS assessment and items with CVI scores ≤ 0.70 (n = 4) were eliminated. Twenty-two items were deployed for field testing. Round one of field testing (n = 12) revealed paramedics infrequently accessing the kitchen (41.6%), bathroom (0.0%), or bedroom (25%) and excluded room-specific items. Five paramedics completed paired assessments in round two using a nine-item tool. One item (κ = 0.8721) returned a high level of agreement, whereas the remaining eight items showed low agreement (κ = 0.3322–0.5369). Conclusions: A nine-item, content-valid, prehospital falls risk assessment tool was created using a standardized process. After two rounds of field testing, the tool is not yet highly reliable. It is hypothesized that the low agreement is due to the variation in prioritization of providers on scene. Future studies will test the accuracy of extrinsic factor identification among secondary care providers only.

139. DEVELOPMENT OF A HYPOTHETICAL ASYMPHILAL MODEL OF PSEUDO-PULSELESS ELECTRICAL ACTIVITY IN SWINE

Norman Paradis, Sarah Crockett, Jeffrey Gould, Christopher Kaufman, Karen Moodie, Dartmouth-Hitchcock Medical Center Category of Submission: SURVIVAL CARE

Background: Pulseless electrical activity (PEA) is an increasingly prevalent rhythm in cardiac arrest, particularly in in-hospital respiratory arrests. Pseudo-PEA (p-PEA), which often precedes true PEA, is characterized by a low acuity state in which cardiac arrest confuses the treating physician. Pseudo-PEA induces a non-palpable blood pressure, and is difficult to treat. We set out to develop a reproducible, stable, and clinically relevant animal model of p-PEA for testing novel treatments. Hypothesis: Rapid induction of a hypoxic asphyxial state will result in a reproducible p-PEA state sufficient for study of pathophysiology and therapy. Methods: A state of PEA was induced via progressive hypoxia in twelve domestic swine ~32 kg with standard physiologic monitoring. Blood flow was measured in the common carotid artery and jugular vein. FO2 was reduced to 6% by increasing the fraction of nitrogen in inspired gas. A target systolic blood pressure (SBP) of 40 mmHg was used to mimic p-PEA. After resuscitation, the animal was stabilized. This cycle of hypoxic p-PEA and resuscitation was repeated until return of spontaneous circulation could not be achieved. Results: p-PEA could be consistently induced via hypoxic asphyxiation. In this model, p-PEA was characterized by a mean heart rate of 77 ± 16 bpm, mean aortic blood pressure of 6 ± 2 mmHg, mean right atrial pressure of 14 ± 2 mmHg, mean carotid flow of 48 ± 16 mL/min, mean jugular flow of 10 ± 2.5 mL/min, and mean intracranial pressure of 2 ± 0.8 mmHg. We were able 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 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-symptoms such as flu-like chills and nausea, abdominal pain, or lightheadedness. Correctly identifying these mild-symptomatic 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 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 databases. The study sample included all cases that arrived to the hospital via EMS. Primary outcome measures were the numbers of hospital-diagnosed AMI cases 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, 461 (5.7%) were identified as AMIs. ALPHA-level AMI cases fell into only five Chief Complaint Protocols (Sick Person, Falls, Unconscious/Fainting, Abdominal Pain/Problems, and Other). Older age and a longer time 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 number of AMI cases associated to the ALPHAslevel is very low and is confined to very few Chief Complaint Protocols. In general, the ALPHA-coded AMIs in this study showed no common characteristics could help identify these cases in the future.

142. **Reducing 9-1-1 Over-Utilization through a Targeted Community Paramedic Hospice Referral Program**

Peter Antevy, Kenneth Scheppke, Juan Cardona, Susan Toolan, Sharon Maraj, Frank Babinec, Julie Corona, Paul Pepe. Memorial Healthcare System Category of Submission: Medical

**Background:** The over-utilization of 9-1-1 systems is a nationwide problem that overburdens EMS agencies and often results in hospital transports better suited for other dispositions. For example, EMS professionals often are called to attend and transport patients who likely require out-of-hospital end-of-life care, yet still have unmet healthcare needs. The purpose of this study was to evaluate if a community paramedic (CP) could successfully refer appropriate patients to local hospice partners and thereby diminish EMS responses for those patients. **Methods:** Between August 1, 2015 and December 31, 2016, front-line EMS crews, guided by established criteria, referred potential hospice candidates to a single designated CP who visited those patients at their residence then referred those patients to hospice via criteria to a hospice partner (VITAS Healthcare) for enrollment. Demographics, diagnoses, length of stay (LOS), and transport times for patients referred for hospice were included. The associated 9-1-1 utilization, before and after enrollment, was tracked and measured. **Results:** The CP attended 320 potential hospice candidates over the same period. Of the 136 patients seen in 2015, 42 (30.9%) were enrolled in hospice and, similarly, 64 of 184 (34.8%) seen in 2016 were also enrolled. Of those 106 total patients enrolled, 56 were men and 48 were women. While ranging in age from 3 to 86 years, 95.2% (n = 101) were over 68 and the main diagnoses included COPD, CHF, dementia and cancer. The average combined 9-1-1 responses for this cohort (Apprace to hospital enrollment) had been 439. This fell to 17 after enrollment (a 96.1% reduction in related EMS utilization). **Conclusions:** Based on this experience, it is possible for only paramedics programs can play a very important role in facilitating the care of hospice-eligible patients and thus help to avoid unneeded system utilization for such patients. Appropriate education of front-line EMS professionals, working in synchrony with a designated CP, can reduce unneeded 9-1-1 utilization, but, more importantly, facilitate the most appropriate and expert care through hospice-partner resources.

143. **Prehospital Provider Year of Hire Correlates to Time Spent On-Scene in Emergent Trauma**

Clark Smith, Steven Hulac, Spencer Knierim, Zachary McAide, David Edwards. Denver Health and Hospital Authority Category of Submission: Trauma

**Background:** 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 the beginning of 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 had lower average on-scene times than those hired later. Paramedics hired in 2006 averaged 7.16 minutes on scene, while paramedics hired in 2015 averaged 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 times. 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 times. 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 times. 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 times. **Conclusions:** There was a distinct association between paramedic year of hire and on-scene times in emergent trauma transports. The objective of this study was to report the first study comparing providers’ years in service to their on-scene times with critically injured patients. Further research is needed to determine if this trend is seen in other similar agencies and to investigate its impact on patient outcomes.
Using anonymous data from 9-4-1 consenting the proportion and 95% Confidence Interval as the first to last pain score. We calculated both from ALS agencies who had an initial score to meet that condition. The objective of this advocates for non-medical personnel to be benchmark these measures. We sought to describe the performance on these measures using a large commercial dataset. Methods: Using anonymous data from 9-1-1 consented agencies, we analyzed 6½-years of data from ESO Solution’s electronic health record (HER) to calculate benchmarks for: (1) the proportion of pre-hospital alert calls, as identified by the CDC trauma triage criteria for transport to a trauma center who have a scene time under 10 minutes, and (2) of patients with any trauma triage score with at least one pain scale documented. For those 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%, 20.4–24.7%) had a scene time less than 10 minutes and 21,665 (32.5%, 30.8–34.3%) had a scene time less than 15 minutes, IQR 14.7(10.2, 20.2). Of 2,166,680 trauma patients, 1,053,747 (48.6%, 48.6–48.7%) had a pain score documented. Of 505,866 patients with initial scores of >5, 305,482 (60.7%, 60.5–60.8%) had an improvement. Of the 310,737 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 for improving bottom quartile 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, Koari Tanaka, Chetan Khurad, Craig Cooley, David Wampler, SAVIHEC Military Fellowship, 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 education 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 tourniquet application for traumatic emergen- cies. Each training course included 20 minutes of didactic instruction on hemorrhage control techniques, encompassing indications for tourniquet application with a 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, 213 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 signif- icant improvement between their initial and post-training responses (Wilcoxon matched-pairs, based on 5-point Likert scale, p < 0.001). Conclusions: In this hemorrhage control education study we found that a short educational intervention can improve laypersons’ willingness and reported willingness to use a tourniquet in an emergency. Significant gender differences exist in the stated willingness to respond in emergencies. Identify barriers to act should be addressed 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 depart- ments (FSEDs) are equipped to care for most emergencies but do not have all the resources that hospital-based emergency departments (EDs) offer. Emergency medical services (EMS) must routinely determine whether a FSED is an appropriate destination. Inappropriate triage may result in increased mortality due to delay in definitive care. We sought to evaluate paramedics’ ability in determin- ing whether a FSED is the most appropriate destination. Methods: We conducted a retro- spective study of two county EMS agencies and two FSEDs over more than 2 years. Both EMS agencies allow paramedic discretion in determining transport destination; both proto- cols read, “Any patient potentially requiring admission in the paramedic’s best judgment (Ex. elderly, weakness, dizziness, dialysis, etc.) will be EXCLUDED and not considered eligi- ble for transport to a FSED.” The primary out- come was whether paramedics can correctly identify patients that can be cared fully at a FSED without additional resources. We sought to identify the percentage of patients brought by EMS to FSEDs that were discharged without additional resources. Results: Between January 1, 2015 and February 6, 2017, 1,247 EMS patients had a selected destination of FSED. We excluded patients that did not arrive at the FSED disposition, left before FSED disposition, or were transferred from the FSED to unaffiliated hospitals. A total of 1,184 patients were included for analysis, and 885 (74.7%) did not require additional hospital resources. Comparing the two EMS agen- cies yielded similar results. Of note, multiple EMS narratives revealed that paramedics trans- ported patients to a hospital due to the hour of a FSED because the main hospital had more resources. Conclusions: The primary goal of triage is “determining how best to get the right person to the right place at the right time with the right amount of resources”. The burgeon- ing of FSEDs highlights the significance of this critical concept. As FSEDs become more popu- lar, education is frequently mentioned as a way to determine which patients are appropriate for specific emergency departments. Our study demonstrated that paramedics have a reason- able knowledge of FSEDs, but more work needs to be done to predict the need for hospital resources.

147. Outcome Impacts of Community Bystander Defibrillation 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 Huang, 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 a community-wide public access defibrilla- tion program and a DA-CPR program in patients after out-of-hospital cardiac arrest at public sites. Methods: A prospective 2-year community-wide observational database col- lected from a metropolitan OHCA e-Registry was studied. The OHCA case and intervention were coded to predict the need for hospital disposition, and the two program interventions were compared. Outcomes included 2-hour sustained ROSC (return of spontaneous circulation) at hospital, survival to hospital discharge, and good CPC (Cerebral Performance Category Scale 1 or 2). All patient prehospital characteristics and outcome relations were evaluated and adjusted by regression analysis. Results: Over the study period a burden is frequently placed on paramedics due to delay in definitive care. We sought to evaluate paramedics’ ability in determin- ing whether a FSED is the most appropriate destination. Methods: We conducted a retro- spective study of two county EMS agencies and two FSEDs over more than 2 years. Both EMS agencies allow paramedic discretion in determining transport destination; both proto- cols read, “Any patient potentially requiring admission in the paramedic’s best judgment (Ex. elderly, weakness, dizziness, dialysis, etc.) will be EXCLUDED and not considered eligi- ble for transport to a FSED.” The primary out- come was whether paramedics can correctly identify patients that can be cared fully at a FSED without additional resources. We sought to identify the percentage of patients brought by EMS to FSEDs that were discharged without additional resources. Results: Between January 1, 2015 and February 6, 2017, 1,247 EMS patients had a selected destination of FSED. We excluded patients that did not arrive at the FSED disposition, left before FSED disposition, or were transferred from the FSED to unaffiliated hospitals. A total of 1,184 patients were included for analysis, and 885 (74.7%) did not require additional hospital resources. Comparing the two EMS agen-
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 injury 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 increasing comfort on an ambulance stretcher.

**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 protocol was randomized over a closed course achieving 30 mph, with 5 complete stops at each head of bed elevation for a total of 90 trials. Subjects rated comfort on a 0–10 scale after each 30° elevation.

**Results:** Peak shear difference between surfaces was ~0.89, indicating that after adjusting for elevation, sensor location, BMI, starting peak shear levels were 0.050 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 < 0.001) for the sacrum, IT, and heel 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 levels of shear and discomfort across all elevations. Recommendations include: focus on the head of bed elevation for comfort, 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 for crashes. While crashes are common, little is known about the factors that lead to crashes. 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 country. Participants were screened for common sleep disorders using the STOP-Bang scale and asked a series of questions about their occupational safety. Sleep disorders were defined as self-reported difficulty sleeping, insomnia, and 10% or more daytime napping. The primary outcomes were the prevalence of common sleep disorders and their association with occupational injury.

**Results:** Of the 1,373 eligible participants, 58.6% completed the study. The prevalence of common sleep disorders was reported by 20.7% of participants. The prevalence of severe sleep disorders was reported by 7.3% of participants. The relationship between sleep disorders and occupational injury is shown in Table 1.

**Conclusions:** The prevalence of common sleep disorders is reported using descriptive statistics. The prevalence of sleep disorders was evaluated using logistic regression models. The relationship between sleep disorders and occupational injury is significant, with an odds ratio of 2.04; 95%CI 1.48–2.81, for motor vehicle crash. Further studies are needed to confirm these findings.

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

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

**Background:** Helicopter EMS agencies are frequently called toprehospital settings to transport intubated patients to a trauma center. There is no current evidence to inform the decision of ventilation in this population. Our goal was to evaluate the effectiveness of manual ventilation via bag-valve-mask (BVM) to mechanical ventilation. Our model was to evaluate the effectiveness of manual ventilation in prehospital settings for trauma patients. We hypothesized that manual control of ventilation will provide adequate support to maintain a physiologic end-tidal carbon dioxide (ETCO2) of 35–45 mmHg.

**Methods:** Using an iterative process, EMS staff developed four realistic scenarios that were used to compare manual ventilation with hand-operated bag-valve-mask (BVM) ventilation. Each scenario was designed to simulate a common high-stress EMS encounter. 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). The same 51 data elements collected. The scenarios used actors in an immersive, 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 were otherwise blind to the purpose of the simulation. Each provider participated in a single scenario as a member of a two-person team. 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 of traumatic 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 characteristics of specific categories of trauma phases that alert providers to the potential for violence.

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

Mallory DeLuca, Donald Garner, Jr., Remle Crowe, Rebecca Cash, Madison Rivard, Jeffery Williams, Ashish 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 an iterative process, EMS physicians and EMS educators and law enforcement training staff developed four simulation scenarios to assess provider responses to threatening situations. Each scenario involved patient presentations and distractors 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 51 data elements collected. The scenarios used actors in an immersive, 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 were otherwise blind to the purpose of the simulation. Each provider participated in a single scenario as a member of a two-person team. 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 of traumatic 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 characteristics of specific categories of trauma phases that alert providers to the potential for violence.

152. **Palliative Care at Home: An Evaluation of Paramedic/Palliative Support**

Ali Carter, Judah Goldstein, Marianne Arab, Michelle Harrison, Willa Crowell, Katherine...
Background: Paramedics are called for crisis situations, and their role involves delivering prehospital care. Our prior pilot data demonstrated that prehospital care during cardiac arrest and other low perfusion states such as out-of-hospital cardiac arrest (OHCA) is crucial for improving patient outcomes. The effectiveness of intravenous (IV) vs. intraosseous (IO) access in cardiac arrest remains uncertain. Therefore, we aimed to determine whether IV access compared to IO access is associated with improved survival, specifically ROSC during cardiac arrest (OHCA).

Methods: We retrospectively reviewed all cardiac arrest (OHCA) patients with IV access (IV group) and those with IO access (IO group) in January 2014 to December 2016. We included all OHCA patients receiving MCPR at MCFR and who had their airway managed with an ET tube. The primary outcome was intra-arrest end-tidal carbon dioxide (eCO2) measurements. We also examined ventilation rates, vital signs upon return of spontaneous circulation (ROSC), as well as vital signs, lactic acid values, and venous or arterial blood gas measurements in the emergency department (ED). We also recorded rates of ROSC and survival at 24 hours, 30 days, and 90 days.

Results: Of 140 patients who received MCPR, valid data were available for 126 patients. Of included patients, 84 (66.7%) had an ET tube placed, and 42 (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 eCO2 values during arrest, vital signs upon ROSC or ED arrival, or arterial or venous partial pressure of oxygen, partial pressure of carbon dioxide, pH, or lactate acid 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 markers of oxygenation, ventilation, and perfusion and no differences in survival for OHCA patient managed with either an ET tube or SGA in combination with MCPR.

156. THE USE OF AIRWAY SIMULATION SCENARIOS TO AUGMENT SYSTEMIC 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 providers has several potential applications. However, provider exposure to low-frequency procedures and identification of systemic quality improvement concerns. The objective of this study was to simulate 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. In this small retrospective evaluation of paramedics in an all advanced life support (ALS) fire-based emergency medical services (EMS) system during two simulated airborne courses at a training-based simulation center. During each session,
teams of paramedics (4–6 individuals) managed one trauma patient and one acute decompen-
sated heart failure patient. Trained EMS agency instructors and simulation center per-
personnel using a standard scoring sheet with predefined data points evaluated teams. The participants successfully endotracheal intubation. Secondary outcomes included several pre-intubation and post-intubation assessment and management steps. Descriptive statistics were used to determine 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 (97%) of the trauma scenarios and 73 (99%) of the heart failure scenarios. Endotracheal 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 (repositioning, suctioning) were performed in 13 (21%) of trauma scenarios and 0 (0%) of heart failure scenarios. In the heart failure scenario, all patients 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 all patients were performed at lower than expected rates. Developing quality improvement initiatives is challenging for low-frequency procedures. This study exemplifies the utility of airway simulation and reporting to help guide 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 Isaacs, 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 the 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 was a retrospective analysis of adverse reactions in patients who were administered hydroxocobalamin in the setting of suspected cyanide poisoning in the patient care reports as well as hydroxocobalamin-specific questionnaires. Patients were separated into two study populations: those in cardiac arrest and those that were not in cardiac arrest. Results: Forty-two patients with BIS scores were enrolled. (ROSC) was achieved in 13 patients (31%). Neither BIS at initiation of CPR (p = 0.513) or BIS nadir (0.075) was significantly associated with ROSC. 29/40 (73%) died prior to or during treatment 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 = 0.648) and nadir did not significantly predict ROSC outcomes (p = 0.995; p = 0.416) or mortality (p = 0.727; p = 0.532). Conclusions: Endotracheal capnography 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 (repositioning, suctioning) were performed in 13 (21%) of trauma scenarios and 0 (0%) of heart failure scenarios. In the heart failure scenario, all patients 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 all patients were performed at lower than expected rates. Developing quality improvement initiatives is challenging for low-frequency procedures. This study exemplifies the utility of airway simulation and reporting to help guide quality improvement initiatives for large EMS agencies.

158. BIS: Bispectral Index Monitoring for Patients during Out-of-Hospital Cardiac Arrest

Ralph Frazcone, 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, proof-of-concept, prehospital, cohort study to determine the relationship between ETCO2 and BIS. Paramedics from three agencies were trained in the application of ETCO2 and BIS and used them 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 measures were enrolled. (ROSC) was achieved in 13 patients (31%). Neither BIS at initiation of CPR (p = 0.513) or BIS nadir (0.075) was significantly associated with ROSC.

159. Descriptive Analysis of Patients Administered Naloxone by Prehospital Providers

Eric Cortez, Kaitlin Bowers, Judd Shelton, Andreas 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. Results were reported as percentages, and medians with interquartile ranges (IQR). Results: A total of 350 patients were included. The median age was 45 years (IQR 31–66), 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, 39% were 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 (presumed overdose), endpoints of therapy (reversal of apnea vs. confusion), need for re-dosing (potent opioid toxicity vs. non-opioid overdose with partial response), and effects 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 Sielger, Washington University/Barnes-Jewish Hospital Category of Submission: Medical

Background: Emergency Medical Services (EMS) professionals 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 morbidity and mortality. 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 protocols. 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) the
adjusted grip allowed for volumes more consistent with lung-protective ventilation strategies and was found to be more consistent with similar strategies used with a smaller BVM. Methods: A patient simulator of a head and thorax was used based on 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 836.0 mL, 834.5 mL, 794.9 mL for the adult BVM (p = 0.003) and 576.0 mL, 571.5 mL, 547.0 mL for the pediatric BVM (p < 0.001). An average of 37 breaths was used based on the thumb and either three fingers, two fingers, and single finger. The tidal volumes recorded with the pediatric BVM were more consistent with lung-protective ventilation volumes.

161. Retrospective Refinement and Validation of the Glycemic 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 Liu

Methods: We conducted a health record review of paramedic call reports and emergency department (ED) health records over a 6-month period (July 1, 2015–December 31, 2015). Prehospital records were queried to identify all adult patients with a prehospital reading of <72 mg/dL (4.0 mmol/L) excluding cardiac arrests and terminally ill patients. We used standardized case report forms to collect data. We defined short-term adverse events as admission to hospital, repeat access to paramedics/ED care, or death, occurring within 72 hrs of the initial prehospital glycemic event. The hypoglycemia decision tool was developed using 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: median age 57.5 years (IQR: 47.9–69.9), diabetic 72.2%, 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 adverse 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, 7 (1.8%) 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 (p = 0.001). The sensitivity of the hypoglycemia decision tool was 93.3%, specificity 17.8%, PPV 25.0%, NPV 90.0%. Conclusions: Demonstrating high sensitivity and specificity, this tool is potentially safe to rule out transport to hospital following paramedic care for prehospital hypoglycemia. Further research is needed to prospectively validate the tool and assess its 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 Dzija, Fangyong Li, Geliang 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 to help paramedics safely rule out transport to hospital following paramedic care for hospital following paramedic care for hypoglycemia. Methods: We conducted a health record review of paramedic call reports and emergency department (ED) health records over a 6-month period (July 1, 2015–December 31, 2015). Prehospital records were queried to identify all adult patients with a prehospital reading of <72 mg/dL (4.0 mmol/L) excluding cardiac arrests and terminally ill patients. We used standardized case report forms to collect data. We defined short-term adverse events as admission to hospital, repeat access to paramedics/ED care, or death, occurring within 72 hrs of the initial prehospital glycemic event. The hypoglycemia decision tool was developed using 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: median age 57.5 years (IQR: 47.9–69.9), diabetic 72.2%, 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 adverse events, renal disease, liver disease, homelessness and on chemotherapy

Paul Banerjee, Paul Pepe, Anminder 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 in 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 outcome correlations 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 resuscitation 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 associated significantly with ROSC, HA and SURV (p < 0.0001) whereas bystander-witnessed arrest cases (only 13%) were not (p = NS). Still, in 95% of cases, the arrest was heralded 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 56% 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 frequent ventricular fibrillation/dysrhythmia etiologies), as expected, shorter elapsed intervals from the moment of arrest to EMS arrival and performance of bystander CPR prior to 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 Cohen, 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. Simulated out-of-hospital cardiac arrest events were drawn from the prehospital gurney in the ER hallway and continued through first 10 seconds of dedicated compressions from the ER department bed. CPR recording defibrillators collected CPR data (chest compression pause seconds, rate (cc/min), depth (in) and CC fraction (CCF, %) throughout the scenario.
Qualitative assessment was performed using video recording and post-simulation participatory observation on the primary outcome was a number of pauses in chest compression longer than 10 seconds. Secondary outcomes include analysis of depth and rate of compressions and qualification of participants and participants’ agreement to errors. 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 seconds. Average depth of compressions ranged from 0.5–1.2 in. Average rate ranged from 107–146 cc/min, with the majority of compressions being between 108–114. Conclusion: Simulated CPR during EMS to ED handoff did not have an issue with prolonged pauses. However, the majority of the resuscitation did not follow the recommended guidelines for depth and rate of compressions. Limitations include that this was a simulated resuscitation scenario and only one size mannequin was used. Future studies observing in the field resuscitation should evaluate the validity of this pilot study findings to possibly guide efforts to improve resuscitation quality.

165. Factors Associated with Pediatric Interfacility Transfer from Emergency Departments
Ali Adehmad, 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. IFT is associated with patient safety risks, a second acute care facility to reach definitive care. Objective: To determine factors associated with the likelihood of pediatric ED patients undergoing IFT. Methods: This study encompassed 3 years (2010–2012) of Maryland HCUP ED visit data. We included patients 0–17 years of age with a diagnosis of pediatric ED patients undergoing Interfacility Transfer (IFT). Results: All 27 (100%) paramedics were able to view the heart at a CUSAS score of 3. Our pilot study suggests that without previous education, paramedics may be able to perform FOCUS using the parasternal long axis view, but have difficulty using the subxiphoid view.

166. Paramedics’ Perceptions of Focused Point of Care Cardiac Ultrasound
John Reynolds, Juan March, Roberto Portela, Steven Taylor, Bryan Kitch. Department of Emergency Medicine, Division of EMS, Brody School of Medicine. Eastern Carolina University Category of Submission: Student, Resident, Fellow
Background: Focused point of care cardiac ultrasound (FOCUS) has been used successfully in screening for many life threatening emergencies such as cardiac standstill, pericardial effusion and others. However, there is limited research on paramedics’ ability to perform FOCUS, but none looking at their perceptions. The goal of this study was to evaluate 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 27 paramedics were recruited. The paramedics attended a 60 minute ultrasound lecture and practicum. An emergency medicine trained physician educated in basic ultrasound skills delivered the educational intervention to the paramedics. We completed a 5 question survey both before and after the education, regarding their perceptions of prehospital ultrasound. A Chi-square test or Fischer Exact test was used to determine statistical significance. Results: All 27 (100%) paramedics completed the pre-survey, education intervention, and the post-survey. Pre-survey only 2 of 27 paramedics felt comfortable performing 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 benefits 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, compared 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 receive ultrasound training, and in the post-survey that number increased to 25 of 27, p < 0.08. Conclusions: This study suggests that without previous education, paramedics may be able to perform FOCUS using the parasternal long axis view, but have difficulty using the subxiphoid view.

167. Paramedics Can Successfully Perform Cardiac Ultrasongraphy Utilizing the Parasternal Long Axis Approach
John Reynolds, Juan March, Roberto Portela, Steven Taylor, Bryan Kitch. Department of Emergency Medicine, Division of EMS, Brody School of Medicine, Eastern Carolina University Category of Submission: Student, Resident, Fellow
Background: Focused point of care cardiac ultrasound (FOCUS) has been used successfully 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 perform FOCUS, but none specifically comparing paramedics’ ability to utilize different cardiac views. This study aimed to determine if paramedics could use 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 including a 30-minute didactic lecture followed by a hands-on practicum concentrated on using the parasternal long axis and subxiphoid views only. An emergency physician educated in basic ultrasound skills delivered the educational 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 Cardiac 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-chamber views). 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 chamber views), 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.
Background: “Transport PLUS” is an educational intervention in which Emergency Medical Technicians (EMTs) are trained to use a tool to identify potential barriers to success and refine the existing checklist and other modifiably aspects of the program to achieve consistency, and resolve disagreements through discussion. 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 homogeneous focus groups led by an experienced facilitator 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 falling follow-ups, leading to fewer opportunities for improvements. 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 inadequately sedated intubated patients, self-extubation, excessive agitation on hospital arrival and vital sign 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 protocol, a protocolized approach to sedation scoring and medication administration may be beneficial. This represents a serious deficiency in our ability to provide high quality care 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 RECURRENT PATIENT ENCOUNTERS THAT REQUIRE ADMINISTRATION OF PREHOSPITALNALOXONE: A RETROSPECTIVE CHART REVIEW

Thomas Dykstra, Jen Knapp, Patrick Dugan, Rhee 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 episodes of overdose that require additional treatment. The aim of this study is to identify the prevalence of recurrent encounters that require the administration of Naloxone to reverse opioid toxicity. The prevalence of 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. for the management of opioid use disorder 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 for the management of opioid use disorder within the United States has continued to increase despite efforts to decrease their accessibility. 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epidemic, STPs have not fully incorporated alternatives to opiates for pain control. This represents an opportunity to improve upon our STPs to include alternatives to narcotic medication for the management of pain, and do our small part to help combat the opioid epidemic. Further research is needed to better understand the barriers to adoption of non-opioid pharmacologic treatment or adjuncts for pain treatment.

173. THE HEAVY LIFT: IMPACT OF A REGIONAL BARIATRIC TRANSPORT PROGRAM

Gerald Wydro, Larry Loosen, Alvin Wang, Department of Emergency Medicine, Aria Jefferson Health Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Obesity is an epidemic in this nation and provides serious challenges to EMS for care and transport. Many systems have identified the problem, but few provide a solution to their providers. Additionally, EMS systems should create a solution that is deployable, cost effective, and provides safe 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 community system served by 25 ambulances covering an area of 622 sq. miles with a population of over 620,000. Requests for EMS service exceed 53,000 annually and are handled via a single 9-1-1 center. The BSU transport system utilizes three specially equipped ambulances (bariatric stretchers, lifts, ramps, and winches) strategically located throughout the county. The BSU ambulances rendezvous with the on scene EMS unit and assist with transport of the patient and crew to the hospital. Results: There were 121 requests for BSU transport during the 12 month period of review with 108 (89%) ending in transport to the hospital. The average weight of transported patients was 419 lbs. Of BSU requests, 66 (55%) were dispatched ALS, with less than half receiving an ALS intervention. The most common complaint type was Acute Extremity Pain (19%). Twenty Four patients (20%) used the transport service. Average on-scene time increased by 150% for patients transported via BSU (30 minutes) compared to our system average on-scene time (12 minutes). Patient and EMS providers reported that the BSU system and there were no reported injuries to patients or EMS providers during the review period. Conclusions: A regional BSU transport system provides a cost effective, safe and dignified means of transport of bariatric patients during EMS response. While more than half of cases were dispatched ALS, the most common complaint was Extremity Pain. No providers used unconventional modes of transportation for transporting a patient to the hospital during this period; 20% of patients utilized the system once during their hospital transport. On-scene time increased significantly however no adverse events were reported.

174. NATIONWIDE QUALITY E-REGISTRY FOR DISPATCHER-ASSISTED CARDIOPULMONARY RESUSCITATION (DACPR) OF OUT-OF-HOSPITAL CARDIAC ARREST (OHCA) – THE DESIGN FOR STRUCTURED MEASUREMENT

Patrick Chow-In Ko, Mei-Fen Yang, Kah-Meng Chong, Hui-Chih Wang, Chien-Hsin Lu, Chih-Hao Lin, Yen-Bing Chen, Yen-Ho Yang, Ming-Shian Lee, Wen-Chih Cheng, Wen-Long Chen, National Taiwan University, College of Medicine, Department of Emergency Medicine Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Following the guidelines of dispatch-assisted CPR (DACPR) may enhance bystander cardiopulmonary resuscitation (CPR). Registry of quality measurement for DACPR has never been explored. We designed a nationwide registry for DACPR performance and innovation as a tool for quality measurement. Methods: A nationwide Google Forms based online e-registry system covering over twenty administrative regions and more than twenty million people was designed and launched for DACPR performance and quality measurement at individual case level for non-traumatic OHCA. Data of 53,760 patients were collected and analyzed for performance rating. System data input could be immediately retrieved as feedback to each corresponding administrative region. Recognition of cardiac arrest by call communication, CPR Instructions upon the recognized OHCA, and chest compression upon the recognized OHCA were the three major categorical performance indicators, and each operational time interval of call-to-recognition, call-to-instruction, and call-to-compression were evaluated. Each categorical performance indicator (Y-axis) was paired with its operational time interval (X-axis) as a set of quality index for diagrammatic comparison in our design. We used regression analysis for statistical analysis. Results: A total of 20% of patients were transported by OHCA EMS. Calls across 18 regions were centralized into the nationwide DACPR Quality Registry in 6 months (minimal 40 to maximal 1,625 cases/region according to its population). Regional recognition rate significantly varied from 10.0% to 88.1% (p < 0.01; averaged 60.4%, SD 21.2%). Instruction rate varied from 41.3% to 93.1% (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 time from call-to-recognition time, call-to-instruction time, and call-to-compression time were 58 (SD 21), 92 (SD 48), and 174 (SD 71) seconds. The designated diagram may easily indicate and compare the individual performance across the joint regions.

175. PILOT RANDOMIZED CONTROL TRIAL OF PELVIC BINDER COMPARED TO STANDARD CARE IN PREHOSPITAL PATIENTS WITH A SUSPECTED PELVIC FRACTURE

Jonathan Studnek, Allison Infinger, Meghan Wally, Sarah Pierrie, Malcolm Leirmoe, Joseph Hsu, Rachel Seymour, Mecklenburg EMS Agency Category of Submission: Trauma

Background: Pelvic ring fractures are associated with high morbidity and mortality, however, pelvic binder usage for prehospital care control has not been rigorously tested. The primary objective of this study was to determine the feasibility of conducting a randomized controlled trial comparing pelvic binder use to standard care in prehospital patients with a suspected pelvic fracture. Methods: This prospective study collected data from an EMS agency - which serves a population of nearly 1.1 million and transports approximately 114,000 patients per year - and a level 1 trauma center. Eligible patients were those ≥18 years with a high-energy mechanism of injury and prehospital suspicion of pelvic fracture. Exclusion criteria were low-energy mechanism of injury, penetrating pelvic injuries, pregnancy, and inablility to obtain pelvic binder. Patients were randomly assigned to treatment, and heparinization. Survival to hospita-
with 33.3% for those on IV-ECMO (p = 0.35). In patients receiving ECLS, 50% survived to discharge; both had refractory VF/VT arrests. No difference in survival was noted based upon early (40%) versus late (50%) 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 order effect was significant. Patients in 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-Ocroah, Vivian Lewis, Todd Jusko, Jeff Bazarian, Edwin van Wijngaarden, Courtney Jones, Department of Environmental Health, University of Rochester Medical Center Category or Submissions: Medical

Background: Advances in medicine require volunteers for research. This requirement may 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 how prehospital factors, specifically mode of Emergency Department (ED) arrival, may influence the recruitment of female subjects in research studies. We explored how prehospital mode of arrival (ambulance vs non-ambulance) affects research participation, sampling female subjects only. We hypothesize that women arriving via ambulance will be less willing to participate in research, compared to those arriving as walk-in/ambulatory participants.

Methods: From January 1 to July 8, 2017, we collected data on 373 women presenting for care in the ED of a Level 1 Trauma Center. All subjects were required to have GCS ≥13 and consented to participation prior to providing informed consent (following standard protocol and/or provider approval). Refusals were compared to participants based on variables abstracted from medical records. Comparisons were made between groups using 2-tailed independent t tests or χ2 tests, as appropriate.

Results: Ambulance users comprised a third of the sample (33.5%, n = 125) and non-users represented 66.5% (n = 248). The mean age was 28.5 ± 7.9 years, with no statistical differences between ambulance users and non-users (p = 0.4). Comparing women, a significant proportion of ambulance users (41.6% vs. 14.1%, p < 0.001) were involved in motor vehicle crashes. Seventy-four percent of ambulance users arrived in 24 hours of their injury. Over a quarter of ambulance users (versus non-users) refused to participate in research (28.8% vs. 19.4%, p = 0.039). Ambulance use was associated with a 69% increased odds of refusal to participate in research (95% CI: 1.02, 2.78). Reasons for refusing included “disinterest in research”, time constraints” and “discomfort with consent process/nature of study”. Conclusions: As hypothesized, ambulance transport to the ED is associated with increased odds of refusal. Further research studies should explore if this finding is unique to females only, and tailor ED-based research recruitment efforts, with ambulance mode of arrival as a consideration.

178. Pediatric Bypass: Characteristics and Effects on EMS Resources

Jennifer Fish, Kevin Pozo, Kyle Fratta, Carla Tilchin, Jennifer Anders, University of Florida College of Medicine - Jacksonville Category or Submission: Pediatric

Background: Regionalization of pediatric care decreases pediatric service availability at community hospitals. However, pediatric regionalization’s effects on EMS operations are unknown. This study describes pediatric transport characteristics focusing on bypass patients.

Methods: This retrospective study examined all transports ages 0–17 years from three geographically diverse EMS agencies (urban, suburban, and rural) over a 12-month period. Those agencies only pediatric destination protocol is the CDC Trauma Triage Tree. Scene response, destination facility, and surrounding facility locations were geocoded, and each facility assigned a category denoting pediatric service availability. Bypass was defined as transport to any facility other than the nearest. Results: The three agencies transported 12,223 pediatric patients during the study period, and 8,039 (66%) bypassed the nearest facility (80% to a higher level of care, and 20% to an equivalent or lower level care). Overall half of urban (71%), suburban (60%), and rural (59%) agency pediatric transports were bypasses. The relative number of children bypassed to a higher level of care were transported to pediatric trauma/specialty facilities (55%), followed by regional pediatric facilities (24%), and comprehensive pediatric facilities (21%). The top five EMS clinical impressions were pain, other, seizure, traumatic injury, and no apparent illness/injury. Patients bypassed to the same or lower level care were transported to community (51%), trauma/specialty (30%), comprehensive (12%), and regional facilities (7%). The top five impressions were pain, other, no apparent illness/injury, traumatic injury, and asthma. For bypass patients, median EMS transport distance was 6.2 km (25–75th percentiles: 3.2–10.8) and median driving time was 15.8 minutes (25–75th percentiles: 10.8–21.9), representing an additional median 2.9 km (25–75th percentiles: 1–6.4) and 6.8 minutes (25–75th percentiles: 3.1–12.6) from the closest facility. Median driving time distance was 2.8 km (25–75th percentiles: 1.6–4.6) and median driving time was 8.6 (25–75th percentiles: 6.2–11.9) for patients transported to the closest facility. Conclusions: Bypass rates in high pediatric bypass rates, which coupled with increased transport distances and times, affect EMS resource allocation by occupying vehicles and crews for longer runs. Future work will determine each bypass’ appropriateness to inform both EMS operations and pediatric destination decisions.

179. Removal of Left Bundle Branch Block from Prehospital ST-Elevation Criteria Decreases Number of Unnecessary Cath Lab Activations

Rachel Semmons, Elizabeth Mannion, Andrew Thomas, Ethon Burnside, Jason Wilser, Cory Thomas, Tampa Fire Rescue, University of South Florida Category or Submission: Cardiac

Background: Prehospital identification of STEMI allows decreased time to PCI. False positive prehospital STEMI alerts may waste resources through unnecessary cath lab activation as well as pose risks to patients. Our current prehospital STEMI Alert Criteria included ST-segment elevation in two or more contiguous leads and/or presumed new left bundle branch block (LBBB) in the presence of anginal symptoms. LBBB was removed from STEMI criteria in the most recent AHA/ACC STEMI guidelines as a result of low specificity. We hypothesized that LBBB refusals and number of false positive activations in our system and can safely be removed from our STEMI criteria. Methods: We conducted a one-year retrospective analysis of our prehospital STEMI alerts. Hospital records were reviewed for ED physician interpretation of EKG findings of ST-elevation, LBBB, or neither of these criteria (non-specific). Primary outcome included lab activation and intervention. Secondary outcomes analyzed were presence of initial elevated troponin. We excluded patients with missing records. Results: A total of 107 STEMI Alerts were transported over the study period, with records available for 102 patients. Of patients identified as EMS STEMI Alerts, 45.1% went to cath, and 36.3% received coronary intervention. Rates of cath lab activation and coronary intervention were significantly higher in patients identified 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 the patient’s EKG showed that he did not have LBBB. We hypothesized that LBBB was not present in our patient cohort. Conclusions: The majority of EMS STEMI alerts did not require emergent cardiology catheterization. LBBB STEMI alerts were due to nondiagnostic EKGs rather than LBBB. It appears that removal of LBBB as a STEMI alert can safely lower STEMI alert numbers. Future protocols will direct EMS to transport patients with LBBB and anginal symptoms to a PCI-capable center without designating the patient as a STEMI alert. Further efforts will be aimed at decreasing the number of false positive alerts through ED 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 Bosson, Jeffrey Saver, Nerse 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 incident DTN for bedside cath. Methods: This is a retrospective analysis from a large regionalized stroke system. EMS utilize the modified Los Angeles Prehospital Stroke Score (mLPASS) and transport all suspected acute stroke patients to one of 46 approved Stroke Centers (ASC). Some ASCs route EMS directly to CT. ASC report patient treatment and outcomes to a registry, from which data were abstracted from May 2015 through April 2016. Adult patients transported by EMS and treated with intravenous thrombolytic therapy (IV tPA) were included. The primary outcome was median DTN at hospitals with CT routing protocols compared to hospitals with ED routing. Secondary outcome was door-to-imaging time, hospital length of stay, and modified Rankin Scale at discharge. A subgroup analysis of patients with positive mLPASS was planned a priori. Outcomes were compared with Hodges-Lehmann difference. Results: EMS transported 6315 patients for suspected stroke and 797 (13%) were treated with IV tPA (2015–2016). Median DTN was 14 minutes (25–75th percentiles: 6–19) versus 29 minutes (25–75th percentiles: 15–54) at ASCs with CT routing protocols compared to ED routing (p < 0.0001, CI 11.29–14.22, p < 0.0001). Median NIHSS was 12 (IQR 8–19) in the CT routing group and 11 (IQR 8–19) in the ED routing group. Positive mLPASS and EMS notifi-
Injury Severity Score Model to Predict Development of Modified Trauma and to Assess Baseline Provider Knowledge and Comfort Level Performing Hemostatic Dressing and Wound Packing Training and Protocols

Kim, Jeong Ho Park, Department of Emergency Medicine, Seoul National University Boramae Medical Center Category of Submission: Trauma

Background: Trauma and Injury Severity Score (TRISS) has been used to predict mortality and to perform quality 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 TRISS model predicting severe disability and worsening disability using age index (0–14, 15–54, 55– years), RTS and ISS. TRISS-D model is a mechanism category divided by blunt or penetrating injury. TRISS-D model 2 added presence of severe head injury when abbreviated injury scale (AIS) of head is above 3. We developed 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 5,487 cases were worsening disability. AUC value of TRISS-D model 1 and model 2 for severe disability was 0.948(95% Confidence Interval (CI): 0.944–0.952) and 0.950(95% CI: 0.946–0.954), respectively. AUC value of TRISS-D model 1 and model 2 for worsening disability was 0.810(95% Confidence Interval (CI): 0.803–0.817) and 0.816(95% CI: 0.809–0.823) respectively. Conclusions: We developed modified TRISS model for functional outcome like severe disability and worsening disability of acute trauma patients. TRISS-D model 2 showed excellent discriminative power with AUC value higher than 0.9. AUC value of TRISS-D model for worsening disability was higher than 0.8.

Most Civilian Prehospital Care Providers Require Additional Wound Packing Training and Protocols


Background: Alberta Health Services (AHS) Emergency Medical Services (EMS) in the City of Edmonton recently introduced an “EMS Continuing Care Urgent Response Team” (ECCURT) to support continuing care providers by providing urgent care on-site, thereby reducing unnecessary patient transfers to emergency departments. ECCURT is comprised of Advanced Care Paramedics and Nurse Practitioners, and is dispatched via a dedicated consult line and/or 9-1-1. Various patient characteristics are tracked within our internal database including age, diagnosis, Goals of Care Designation (GCD), and Canadian Triage Acuity Scale (CTAS) score. Objectives: This study will provide an analysis of various ECCURT patient characteristics, and determine whether age, GCD and CTAS score are correlated with frequency of transport to hospital. Methods: This is a six-month retrospective, observational study of patient data. All new patients assessed between January 1, 2016 and June 30, 2016 were included. Multiple regression analysis was performed to determine whether a statistically significant correlation exists comparing age, GCD and CTAS score with transport frequency. Results: A total of 471 (83%) of 567 new patients assessed by ECCURT during the study period had established GCDs in place; 521 (92%) of our patients had a CTAS score recorded. There was no correlation between patient age and presence of severe disability and worsening disability. AUC value of TRISS-D model for worsening disability was higher than 0.8.

185. Transport Determinantes for Continuing Care Patients Assessed by an EMS Urgent Response Team: A Retrospective Observational Study

Kevin Lobay, Robyn Palmer, Lorissa Mews, Robert Sharrman, Brian Boswell, Priya Jagg, University of Alberta Department of Emergency Medicine Category of Submission: Operations, Quality, Safety Systems, Disaster

Background: Alberta Health Services (AHS) Emergency Medical Services (EMS) in the City of Edmonton recently introduced an “EMS Continuing Care Urgent Response Team” (ECCURT) to support continuing care providers by providing urgent care on-site, thereby reducing unnecessary patient transfers to emergency departments. ECCURT is comprised of Advanced Care Paramedics and Nurse Practitioners, and is dispatched via a dedicated consult line and/or 9-1-1. Various patient characteristics are tracked within our internal database including age, diagnosis, Goals of Care Designation (GCD), and Canadian Triage Acuity Scale (CTAS) score. Objectives: This study will provide an analysis of various ECCURT patient characteristics, and determine whether age, GCD and CTAS score are correlated with frequency of transport to hospital. Methods: This is a six-month retrospective, observational study of patient data. All new patients assessed between January 1, 2016 and June 30, 2016 were included. Multiple regression analysis was performed to determine whether a statistically significant correlation exists comparing age, GCD and CTAS score with transport frequency. Results: A total of 471 (83%) of 567 new patients assessed by ECCURT during the study period had established GCDs in place; 521 (92%) of our patients had a CTAS score recorded. There was no correlation between patient age and presence of severe disability and worsening disability. AUC value of TRISS-D model for worsening disability was higher than 0.8.

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correlated with transport frequency independently. GCD and CTAS score may be quite useful for pediatric Care EMS systems 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 Klebaker, Joshua Schwarzbaum, Andrew Parrish, Michael Carr, Andrew Torres,avin Ariyaprakai, Amundep Taga, Eric Eichmiller, and Robert Marg Merlin, Newark Beth Israel Medical Center Categor y of Submission: Cardiac

Background: Refractory ventricular fibrillation (RVF) has been defined as VF that persists after 5 standard attempts at defibrillation (SD). Though this interaction is critical to ensure patients receive appropriate prehospital care. Objective: The objective was to describe the quality of care for children with 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: A retrospective review 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 trained on 100% of cases. Predefined criteria which gauged the efficiency of communication that occurred during each interaction. Results: There were 454 online interactions in the fiscal year. Results: As audio was unavailable and 27 could not be retrieved due to technology failure at the dispatch level. Therefore 413 cases were assessed. Three non-dated thirty-eight patches (81.8%) were mandatory provincial patch with 289 (85.5%) regarding patients in cardiac arrest. Analgesia administration made up 30.7% of the non-mandatory calls, and all resulted in medication orders. In 100% of patches additional information was requested by the health professional and in 131 (31.7%) patches no patch was made by the health professional. The average length of patch was 0.0203 (SD = 0.0107) and the paramedic had to wait on average 0.0111 (SD = 0.0044) before talking to an oversight 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 oversight physicians to make informed clinical decisions optimizing the care provided to patients. To further enhance the medical control provided by oversight physicians it would be beneficial to determine the most effective way to provide EMS training to these physicians. Also, 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 Fish, Kevin Poter, Carla Tilchin, Kyle Fratta, Johns Hopkins University School of Medicine Categor y of Submission: Pediatric

Background: Regionalization of pediatric care decreases available pediatric services at community hospitals while 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. EMS services use the same patient care protocols, EMR, and Helicopter EMS (HEMS) system. Each patient transport location, actual transport times, demographic, and clinical variables were abstracted from the EMR. In urban and destination hospital locations were geocoded to calculate road driving distance. Each agency’s baseline EMS utilization for pediatric 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. Urban (males n = 5,987, rural n = 243). Total EMS utili zation 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 41,873 minutes and 7,605 miles in the rural jurisdiction. HEMS use for pediatric transport was zero in the urban county, 0.1% in the suburban county and 4.8% in the rural central county (p < 0.001). Mean road 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 7.6, 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, 0.178, and 0.138 road miles per pediatric citizen, 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 Threlfall, Adam Singer, and Benjamin Kest. Johns Hopkins 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 on a 5-point Likert scale from “strongly disagree” to “strongly agree” and analyzed with Chi square tests. Results: Of 54 analyzable surveys, 81.5% respondents were paramedics and 18.5% were EMT-Bs. 78% of respondents were male. Mean age was 39 with an average 18 years of EMS experience. 61% held college degrees, 48% subscribed to medical journals, and read articles a couple times a week (20%), month (32%), or year (35%). At least 95% of providers agreed about the importance of pre-hospital EBM and their pediatric ED was current with medical advances. Paramedics were more likely than EMT-Bs to disagree that EMS protocols are updated promptly. 57% agree that patient care decisions should be based on research evidence and not personal experience, (45% males vs. 8% females). 65% of those surveyed disagreed with limiting the rights of an individual to better the care of a large group, and disagreement was higher in females than males (92% vs. 57%), respectively. A total of 96% agreed with an option to read research articles for CME; those without a college degree were more likely to disagree. No significant relationship between age, education, provider level, or experience was found for frequency of reading research articles. A total of 65% disagreed that spending an additional 5 minutes after a call to complete clinical trial paperwork would be a burden; those who read articles a couple times a week were more likely to agree. A total of 44% disagreed with enrolling a critical patient in a trial if dedicated consent is obtained. A significant relationship to age; younger respondents were less likely to disagree than other age groups. Conclusions: In this cohort of prehospital providers, furthering clinical research and involvement in future prehospital clinical trials was overall well received.
90. Can Heart Rate Variability Risk Stratify Patients with Undifferentiated Non-Traumatic Chest Pain?

Juan March, Carmon Russoniello, Nicholas Murray, Mary McDonald, East Carolina University Department of Emergency Medicine Division of EMS 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 respiration and is identical to respiration 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 100,000. 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 physiological status monitor (PSM) 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 electrocardiogram (ECG) or positive cardiac catheterization, 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. 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. Further studies in the prehospital environment with a larger sample size is needed to determine if it can be used by EMS to rapidly risk stratify patients with undifferentiated non traumatic chest pain.

91. Correlation of EEG-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, Kyoung Jun Song, Hee Chan Kim, Shin Sang Do, Seoul National University Hospital, Department of Emergency Medicine Category of Submission: Cardiac

Background: Evaluation and monitoring of brain death is an important determinant of resuscitation of cardiac arrest. We developed non-invasive EEG-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 for every 50 seconds in 10 phases. Delta EBRI was calculated from selected single EEG channel which have 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 coefficient 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 confined of quality of CPR received. Delta EBRI obtained during high quality CPR was significantly higher than delta EBRI of lower quality CPR (HQ: Median = 0.17, (0.04-0.30), (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 successfully obtained during resuscitation and had statistically moderate correlation with ETCO2.

92. Social Connectedness and Coping Styles in EMS Workers and Their Association with Burnout and Perceived Stress

Lori Boland, Pamela Mink, Jonathan Kamrud, Jessica Jensen, Charles lick, Andrew Stevens, Allina 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 147-item electronic survey was distributed to employees of a large non-profit emergency medical services (EMS) agency. 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 years. The prevalence of burnout was 18%, and 49% of respondents scored ≥ 31 on the PSS, which is considered a cut-off for high stress. After adjustment for age, gender, EMS tenure and marital status, providers characterized as socially isolated were more likely to experience burnout than those who were socially integrated (OR = 3.8, 95%CI = 1.3-11.9, p = 0.003). 408 of the patients received Albuterol for bronchospasm. Rates of EKG & end tidal carbon dioxide (ETCO2), vascular access and CPAP complications have significant utility to improve patient care and outcomes in respiratory distress cases. For the subset of patients who received Albuterol for bronchospasm, the rates of administration of Methylprednisolone, Magnesium Sulfate and 3,1000 Epinephrine were compared between the two time intervals. Results: There were 390 respiratory distress cases in the 2014 interval and 885 in 2017. In 2014 there were improvements in EKG monitoring from 32.6% to 45.9% (p < 0.0001) of cases, ETCO2 monitoring from 7.1% to 17.3% (p < 0.0001), vascular access from 37.2% to 45% (p = 0.0009) & CPAP use from 6.5% to 10.8% (p = 0.0013). 408 of the patients received Albuterol for bronchospasm in 2014 compared to 306 in 2017. In this subset there were improvements in the administration of Methylprednisolone from 24.4% in 2014 to 52% (p < 0.0001), Magnesium Sulfate from 12.5% to 19.9% (p = 0.0091) & 3,1000 Epinephrine from 3.2% to 6.8% (p = 0.05). These changes have been 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). Conclusions: The implementation of the Critically Ill Patient Bundle of Care on the performance of key prehospital 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). Rates of EKG & end tidal carbon dioxide (ETCO2), vascular access and CPAP complications have...
ing to better understand the types of errors, so as to improve implementation of future treat-ments. Guidance and help to determine what further training if any is needed and plan for future protocol roll out difficulties. Methods: Retrospective chart review of calls occurring in the state of California in 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. Protocol violations were identified in 26% (14% ± 6 to 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 by patient. Pediatric administrations. 9% (95% CI 4–20%) of haloperidol administrations were not 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 byprehospital providers, without the need to con-duct further research about the type and frequency of errors observed when adopting a new protocol and this analysis can provide useful insight to help better tailor training for new protocol implementation. Additionally, unnec-essary calls to OLMC were observed, suggesting a lack of familiarity or confidence with the new protocol. This investigation demonstrates potential for protocol violations in new protocols 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-ACUITY 9-1-1 PATIENTS

Michael Gonzalez, David Perse, Guy Gleis-berg, Karen DuPont, Andrew Kincannon, Homecare Fire Department Category or Submission: 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 EMS Physicians believe that not all patients require ALS care and in these circumstances, alternate transport and desti-nation may be appropriate. EMS patient disposi-tions are primarily determined by the pre-medical 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 disposition 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 metropoli- tan urban fire-based EMS system from December 2014 through May 2017. On site, ED physicians make a determination as to the patient’s disposition. Further research is needed to determine the best practices for training and implementation of new clinical protocols. Index Terms: Telehealth, Physician, EMS, Alternate Transport

196. NOVEL MEASURE TO CAPTURE TRANSACTIONAL STRESS IN PARAMEDIC SERVICES

Elizabeth Donnelly, Paul Bradford, Cathie Hedges, Marsha Ashbaugh, Peter Morassutti, University of Windsor Category or Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS, DISASTER

Background: In the past few years, there has been an increase in awareness of the challenge of managing work related stress in EMS. Extant research has identified different types of chronic and critical incident stress to stress reactions like posttraumatic stress. However, there is no tool to capture the transactional stresses that are associated with the day to day provision of service (e.g., dealing with offload delays or manda-tory overtime) and interacting with allied pro-fessions (e.g., emergency department staff) or allied agencies (e.g., law enforcement). The pur-pose of this study was to develop and validate a measure which captured transactional stresses in paramedics. Methods: An online survey was conducted with ten Canadian Paramedic Ser-vices with a 40.5% response rate (n = 717). Factor analysis was used to identify variation in responses related to the latent factor of tran-actional stress. The scale was validated using both exploratory and confirmatory factor analy-ses. Results: The sample of transactional stress questions was subjected to Confirmatory factor analy-ses (EFA n = 360) / CFA n = 357). In the exploratory factor analysis, principal axis fac-toring with an oblique rotation revealed a two-factor, twelve item solution, (KMO = .832, x² = 1440.19, df = 66, p < .001). Confirmatory factor analysis also endorsed a two factor, 12 item solution, (x² = 130.39, df = 51, p < .001, CFI = .95, TLI = .93, RMSEA = .05, SRMR = .06). Results supported two groups of six-item factors that captured transactional stress in the provision of service. The factors, clearly aligned with transactional stresses internal to the ambulance and transactional stress rela-tionships external to the ambulance. Both sub-scales demonstrated good internal reliability (α = .843, w2 = .768) and were correlated (p = .01) with a convergent validity measure. Conclu-sions: This study successfully validated a two-factor scale which captures stress associated with the day to day provision of service and the interaction with allied professions. The develop-ment of this measure of transactional stresses further expands the potential that paramedics, Paramedic Services, employers, and prehos-pital physicians may understand the dynamics that influence provider health and safety. As a result, there is greater opportunity to intervene holistically to improve paramedic health and well-being.

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 or 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 appro-priate triage 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. During data collection, data were then manually entered. Ambulance services were all previously given a list of FSED capabilities and guidance on how to triage patients to the FSED. Results: A total of 105 patients were discharged home directly from the FSED and 20 transports directed 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 in age 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 statistically significant difference between the 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 (183.5 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 AGENCIES’ PEDIATRIC RESPIRATORY DISTRESS PREDICTION AND THEIR CORRESPONDING LEVEL OF EVIDENCE

Jennifer Farah, J. Joelle Donofrio, Nicholas Aldridge, University of California, San Diego Category or Submission: STUDENT, RESIDENT, FELLOW

Background: We sought to compare California local EMS agencies’ (LEMSA) protocols and review evidence-based guidelines on the treatment of three main pediatric respiratory complaints by presentation: asthma ( wheezing), bronchiolitis (wheezing < 24 months), and croup (stridor). Methods: Thirty-two available protocols from 33 California LEMSAs 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-atrics (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 review, as California LEMSAs do not currently use steroids prehospital. The evidence-based tables were compared to California local EMS agency protocols. Results: Among the 33 LEMSAs, wheezing protocols had the least amount of variability with only two of the six treatments, ipratropium (15/33) and nebulized epinephrine (3/33), having >2 LEMSAs without the treatment. The most common wheezing treatments included albuterol (33/33) and IV/IM epinephrine (33/33). The least common treatments included nebulized epinephrine and magnesium. All current 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 distress. Current evidence-based 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 9-1-1 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 resource-intensive, 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 prior quarter. The social worker then assigned enrollees 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 demographics for the EMS responded 389 times for 45 patients. Twenty-eight were female, the median age was 64 (IQR 26-93), 86% 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 historical quarter the cohorts had a similar number of responses (DE 9.5 ± 7.2, CC8.4 ± 4.7, p = 0.54). More patients in the DE cohort received multiple interventions (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 = 0.001). 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.

200. URBAN LAW ENFORCEMENT NALOXONE DEPLOYMENT FOR TREATMENT OF SUSPECTED OUT-OF-HOSPITAL OPIOID OVERDOSES: A PILOT PROGRAM

Eric Cortez, David Keseeg, James Davis, Kenneth Kuebler, Ashish Panchal, Harbor-UCLA Medical Center Hospital Category of Submission: Operations, Quality, Safety Systems, Disaster 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 (97%) 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% (28/29) reported no issues on the scene. Conclusions: This study suggests that urban LE agencies partnered with EMS may successfully use LE to coordinate and administer naloxone to 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 Hoon Kim, Sang Do Shin, Kyung Jun Song, Ki Jeong Hong, Young Sun Ro, So Yeon Kong, Seoil Noh, Young Sup Park, Yong Jin Kim, and In Hwi Kong, 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 was stratified 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 an ambulance station on survival outcome of OHCA. Results: From 2013 to 2014, total of 47,637 OHCA cases were reported by 1,205 ambulance stations nationwide. Mean annual number of OHCA dispatched from each ambulance station was 19.3 cases. Overall survival at discharge rate was 5.5% with 2.9% of discharge with favorable neurological outcome. Survival was high in groups with largest case volume (7.2% in group 4) and lowest case volume groups (3.3% in smallest case volume group). Adjusted odds ratio of largest case volume per ambulance station for predicting survival was 1.4695% CI 1.26–1.70. Conclusions: Increasing case volume per ambulance station might be associated to survival outcome of EMS treated OHCA. Appropriate 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 TRANSFERRED TO A LEVEL I TRAUMA CENTER

Courtney Jones, Vasiith Srinivasan, Jeremy Cushman, Julius Cheng, Timmy Li, Suzanne Gillespie, Martina Anto-Ochra, Nancy Wood, Heather Lenhardt, Ann Dozier, Jeffrey Bazarjan, Manish Shah, Lakers Hospital, Department of Medicine and Dentistry Category of Submission: Trauma Background: Traumatic brain injury (TBI) is a substantial source of death, disability, and healthcare utilization among older adults. Older patients are frequently under-represented by EMS to community hospitals and require subsequent transfer to a trauma center for further care. However, a minimal amount is known regarding resource utilization of care and patient outcomes at the final receiving hospital. We aimed to describe trauma center care among geriatric transfer 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 a chart record abstraction was conducted, including
computed tomography (CT) findings, procedures, length of stay (LOS), and ED disposition. We present descriptive statistics to characterize the study sample including proportions and confidence intervals. Results: There were 205 patients transported by EMS to a community hospital with initially asystolic cardiac arrest as compared to the Level I trauma center. Thirty had confirmed abnormalities on head CT (14.6%). The mean age was 78 years (range: 55–91), 57% female, and the most frequent mechanism of injury was falls (93%). Median length of stay at the trauma center was 13.5 days (range: 0–230), with 8 patients staying one day or less. Of the patients, 48% were on subarachnoid hemorrhage (60%), subarachnoid hemorrhage (50%), and intraparenchymal hemorrhage (36.7%). Five patients required neurosurgical intervention (17%). Two patients were discharged to the control fall patients who are at high risk for TBI are warranted.

203. RELATIONSHIPS BETWEEN RIGHT ATRIAL AND AORTIC PRESSURES AND JUGULAR AND CAROTID FLOWS RESPECTIVELY IN A SWINE MODEL OF ASPHYXIAL PSEUDE-PULSELESS ELECTRIC ACTIVITY
Norman Paradis, Karen Moodie, Sarah Crockett, Jeffrey Gould, Christopher Kaufman, Dartmouth-Hitchcock Medical Center Category of Submission: Cardiac
Background: The initial cardiac rhythms found during in-hospital respiratory arrests are typically either pulseless electrical activity (PEA) or asystole. Pseudo-PEA (p-PEA) often precedes true PEA and is characterized by a low-flow state in which cardiac contraction produces a low-flow state in which cardiac contraction produces a non-palpable blood pressure. The purpose of this study was to characterize the relationships between venous and arterial pressures and the flows that drive brain perfusion in a hypoxic asphyxial model of p-PEA. Hypothesis: Right atrial pressure (RAP) would be related to jugular venous flow (JVF), and aortic pressure (AoP) would be related to carotid flow, and that these flows would change with time during p-PEA. Methods: Pseudo-PEA was induced via hypoxic asphyxiation in 12 domestic swine (<32 kg) with standard physiological monitoring. AoP and RAP were measured with solid state transducers placed in the thoracic aorta and right atrium. Blood flow was measured in the common carotid artery and jugular vein using non-invasive flow probes. FIO2 was decreased to 6% by increasing the fraction of nitrogen. A target systolic blood pressure (SBP) of 40 mmHg was used to define p-PEA. The relationship between pressures and flows was determined with a Pearson correlation coefficient. Results: Overall, RAP was significantly negatively correlated with LVF (r = −0.51, p < 0.05), however, the relationship varied over time during p-PEA (Figure). AoP was significantly positively correlated with carotid flow (r = 0.85, p < 0.05), but did not appear to change with time as seen with RAP and JVF. Conclusions: In an asphyxial model of p-PEA, venous blood pressures and flows were negatively associated and the relationship varied as a function of time. Arterial pressures and flow were positively associated and the relationship varied less over time. These findings have implications for how and when chest compressions or other interventions should be applied when treating p-PEA.

204. CHANGE IN THE UTILIZATION OF EMERGENCY CARE AFTER ESTABLISHMENT OF EMERGENCY MEDICAL CENTER IN YAOUNDE: A BEFORE AND AFTER CROSS-SECTIONAL ANALYSIS
So Yeon Kong, Sang Do Shin, Young Sun Ro, Yun Jeong Kim, Jong Sik Jeong, Dae Han Wi, Seoul National University Hospital Category of Submission: MEDICAL
Background: In effort to address the shortage of emergency medical care in Yaounde, Yaounde Medico-Surgical Emergency Center (CURY) was established in June, 2015 in Yaounde, Cameroon. To evaluate its impact on the communities of Yaounde, we assessed the changes in utilizations 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 Yaounde. 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 collected from 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 there were no significant age and gender distributions with mean age of 24 and 54% being male. In 2014 survey, healthcare utilization rates for outpatient, emergency unit and hospitalization services were 57.2%, 4.3%, and 9.6%, respectively. In 2017 survey, corresponding rates were 32.4%, 5.7%, and 8.7%, respectively. The increase in the utilization rates between two surveys were statistically significant (p < 0.01). When the emergency unit utilization rates were examined by 3 km radius from CURY, there was decrease in the utilization of emergency care among residents living near CURY (27.5% in 2014 to 22.8% in 2017). Conclusions: After the establishment of emergency medical center (CURY) in Yaounde, Cameroon, the utilization of emergency care was significantly increased. This increase was regardless of the distance from the patients’ residential places to the emergency medical center. The establishment of an emergency medical center may have impacted the utilization of emergency care throughout the entire communities of Yaounde.

205. PREHOSPITAL PUSH DOSE EPINEPHRINE IN HYPOTENSION
Mark Merlin, Navin Ariyapakrak, Ammudeen Tagore, Matthew Harris, Andrew Parrish, Josh Schwarzbaum, Alex Torres, Michael Carr, Susmith Koneru, Nirav Bhut Israel Medical Center/RW/Barnabas-MONOC Category of Submission: MEDICAL
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" has long been used by anesthesiologists for acute hypotension in the operating room. Push dose epinephrine (PDE) offers another option for 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 statistics on demographics, biometrics and derived the mean, median and standard deviations for continuous variables of both the interventional and control groups. RESULTS: PDE was administered 75 times in the two-year study period. 22 of those were peri-intubation (treatment group). Mean age in PDE was 69 years vs. 72.4 years in the control group (P = 0.001). Only 7 patients receiving pre- and post-intubation vital signs of patients receiving PDE, we found significant increases in mean HR, SBP, DBP, MAP, and SI (P < 0.05). 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, relatively quick 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
Thomas Lardaro, Dustin Holland, Tom Arkins, Dan O’Donnell, Indiana University School of Medicine Category of Submission: MEDICAL
Background: Stroke is a time sensitive emergency that requires appropriate dispatch to 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 large U.S. metropolitan area in predicting whether or not a patient is 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 37.6–48.99), specificity of 98.1% (95% CI 97.9–98.2), negative predictive value of 17.1% (95% CI 15.1–19.3), and negative predictive value of 99.5% (95% CI 99.4–99.5). Conclusions: These findings imply EMS dispatch alone is not sufficient to rule in stroke. In the absence 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) in the absence of stroke 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 algorithms that can appropriately triage of non-stroke patients to such resources as MSUs to ensure patient safety and to prevent delays in definitive care.