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1. In Out-of-Hospital Cardiac Arrest, Longer on Scene Times Are Associated with Higher Survival Rates: “Scoop and Run” May Be Deadly

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Background: The approach to managing out-of-hospital cardiac arrest (OOHCA) has generally involved either minimal on-scene resuscitation to reduce time to arrival at hospital or extended care at the scene to increase the chance of return of spontaneous circulation (ROSC) before transport. This study compared patient outcomes across EMS agencies with respect to the duration of on-scene time. We hypothesized that EMS agencies with greater average time on-scene would have more favorable outcomes.

Methods: The Cardiac Arrest Registry to Enhance Survival (CARES) was used to identify OOHCA cases, including characteristics and outcomes. EMS agencies were included if they submitted at least 80 OOHCA cases from 2013 to 2017. To study outcomes based upon culture of OOHCA management, outcomes were studied by EMS agency rather than by individual patient cases. Agencies in the top and bottom quartiles of on-scene time duration were categorized as high (HOSTAs) and low on-scene time agencies (LOSTAs), respectively. Generalized estimating equation models compared HOSTAs and LOSTAs.

Results: We classified 89 agencies as HOSTAs (24,114 patients, average ≥25 minutes on-scene) and 89 agencies as LOSTAs (37,297 patients, average <18.9 minutes on-scene). Among patients transported, HOSTAs were more likely to have a shockable rhythm (28.4% vs. 22.2%, OR = 1.4, 95% CI: 1.2–1.5), a witnessed arrest (65.1% vs. 53.6%, OR = 1.7, 95% CI: 1.5–1.9), and receive bystander CPR (41.9% vs. 37.0%, OR = 1.3, 95% CI: 1.1–1.5) than LOSTAs, all p < 0.001. When controlling for these and other patient characteristics, including mechanical CPR device use, HOSTAs had a higher proportion of ROSC on emergency department arrival (66.7% vs. 31.1%, OR = 4.6, 95% CI: 3.5–6.0, p < 0.001), survival to discharge for transported patients (22.3% vs. 11.2%, OR = 2.6, 95% CI: 2.0–3.4, p < 0.001), and good neurologic outcome among survivors (84.9% vs. 78.6%, OR = 1.3, 95% CI: 1.0–1.7, p = 0.046) than LOSTAs.

Conclusions: This study suggests that HOSTAs have more favorable patient outcomes compared to LOSTAs. Results indicate that spending more time on-scene resuscitation is associated with higher rates of ROSC, survival, and survival with good neurologic function.

2. Utility of a Prehospital “Crashing Patient” Care Bundle in Reducing the Incidence of Post EMS Contact Cardiac Arrest of Critically Ill Medical Patients

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Background: Patient care bundles have been advocated as a process based system to improve patient care and outcomes using evidence based guidelines. We sought to evaluate the utility of a prehospital “Crashing Patient” Critical Care Bundle in reducing the incidence of post EMS contact cardiac arrest for critically ill medical patients.

Methods: A critically ill medical patient “Crashing Patient” Care Bundle was developed and implemented in an urban EMS system in 2014. The key elements of this care bundle were: 1) No move of the patient until care objectives have been completed; 2) Apply physiological monitoring; 3) Aggressive management of the airway via basic and advanced methods; 4) Aggressive management of respiratory distress/failure via CPAP/positive pressure ventilation via BVM; 5) Early IV/IO access, aggressive management of hypotension via fluids and vasopressors; 6) Maximal medication therapy based on the patient’s underlying pathology.

Yearly case incidence was measured as percent of system medical cardiac arrests that were post-EMS contact so as to compare to the incidence reported in the Cardiac Arrest Registry to Enhance Survival (CARES®) database. Yearly analysis of the subset of patients experiencing EMS witnessed cardiac arrest ≥5 minutes after contact (allowing time for bundle implementation) was also conducted.

Results: The system incidence of post EMS contact cardiac arrest decreased from 12.1% in 2015 (37 cases/299 arrests) to 5.8% through July 2018 (10 cases/171 arrests) (p = 0.0251). The incidence of “911 Responder Witnessed” cardiac arrest reported in the CARES® Registry increased from 12.1% to 12.5% from 2015–2017. The system incidence for post EMS contact cardiac arrest ≥5 minutes after contact decreased from 9.7% in 2015 (30 cases/299 arrests) to 4.7% through July 2018 (8 cases/171 arrests) (NS, p = 0.0519).

Conclusions: The implementation of a prehospital “Crashing Patient” Care Bundle significantly reduced the incidence of post EMS contact cardiac arrest in the field. The there was a trend for reduced incidence of EMS witnessed cardiac arrest ≥5 minutes after contact that was not quite significant. The “Crashing Patient” Care Bundle appears to have utility to improve care for critically ill patients in the prehospital setting.

3. Prehospital Ketamine Administration for Excited Delirium: Demographics, Side Effects, and System Implications for an Urban Hospital-Based Ambulance System

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Background: Patients with excited delirium (ExDS) and extreme agitation pose a safety hazard for themselves and for Emergency Medical Services (EMS) providers. A number of sedative agents can be used in this patient population. Increasingly, ketamine, a dissociative anesthetic, has been used in the prehospital environment for rapid sedation.

The purpose of this study was to describe characteristics and complications of prehospital ketamine administrations in an urban hospital-based EMS system.

Methods: We performed a retrospective cohort study of adult patients who received ketamine (5 mg/kg IM) for ExDS from June 2013 through December 2016. The Denver Paramedic Division is the principal advanced life support EMS agency for Denver County and receives approximately 120,000 911 calls annually and transports 70% to area hospitals. Using standard chart abstraction, we collected demographics, trip details, intubation, disposition, length of ED stay, admission, and complications using prehospital trip sheets, and ED and hospital records. Descriptive and bivariate statistics were performed.

Results: During the study period, ketamine was administered to 228 patients. The median age was 30 (IQR: 24 vs. 37), 86% were male, and 61% were transported emergently to the hospital. Median prehospital heart rate and systolic blood pressure were 120 (IQR: 130 vs. 156) and 160 (IQR: 140–182), respectively. Additionally, 30% (95% CI: 24–37%) required intubation, of which 56% were for airway protection and
31% for respiratory failure; 59% (95% CI: 52–65%) were ultimately discharged home, although the median ED length of stay was 7.9 (IQR: 2.6–12.2) hours; moreover, 11% (95% CI: 7–16%) were noted to have a minor complication (e.g., laryngospasm, respiratory depression), and 0% (95% CI: 0–2%) required intubation. Patients who were transported emergently were more likely to require intubation (p = 0.02) but not more likely to be admitted to the hospital (p = 0.08). Conclusions: Prehospital ketamine appears to be a rapid and effective means of chemical sedation in patients with ExDS; however, intubation, hospitalization, and overall resource use remains high after its use.

4. SURVIVAL AFTER INTRAVENOUS VS. INTRAOSSEOUS AMIODARONE, LIDOCAINE, OR PLACEBO IN OUT-OF-HOSPITAL VENTRICULAR FIBRILLATION

Mohamud Daya, Brian Leroux, Thomas Rea, Paul Dorian, Joshua Lupton, Tom Aufderheide, David Barbić, James Christenson, Caroline Herdeman, James Menegazzi, Laurie Morrison, Craig Newgard, Gary Vlike, Peter Kudenchuk, Department of Emergency Medicine, Oregon Health & Science University CATEGORY OF SUBMISSION: CARDIAC

Background: Antiarrhythmic drugs have not demonstrated improvement in survival from out-of-hospital cardiac arrest (OHCA) due to shock-refractory ventricular fibrillation or pulseless ventricular tachycardia (VF/VT). Whether this apparent inefficacy might be influenced by the route of drug administration remains unknown. Methods: In this pre-specified analysis of a randomized, placebo-controlled trial, we compared survival to hospital discharge in adults with non-traumatic, shock-refractory VF/VT OHCA who were randomized to antiarrhythmic drugs versus placebo in the Resuscitation Outcomes Consortium Amiodarone, Lidocaine, or Placebo Study (ALPS) stratified by the route of vascular access (IO vs IV) for drug administration. Results: A total of 3,026 randomized patients, 3,019 had a known vascular access site, 2,358 of whom received ALPS drugs IV and 661 by an IO route. The IO and IV groups were similar in age, location of arrest, whether the arrest was bystander or EMS-witnessed, receipt of bystander CPR or shock, compression rate, peri-shock pauses, advanced airway placement, time interval from emergency call to vascular access and study drug administration, and receipt of other resuscitation drugs. Overall survival was 23%. Unadjusted and adjusted analyses yielded similar findings among active drug vs. placebo recipients in IV and IO treatment groups: For the 2,860 patients (95%) with complete covariate data, adjusted absolute survival did not differ between recipients of IO lidocaine vs. placebo (HR 0.84, CI: 0.53–1.35) or IV lidocaine and lidocaine compared to placebo were associated with a significant increase in survival to hospital discharge when administered IV but not IO. Although suggestive, the study was underpowered to assess statistical interactions between IV and IO administered drugs. Whether the route of drug administration itself plays a determining role in antiarrhythmic drug effectiveness in OHCA merits prospective investigation.

5. SHARED DECISION-MAKING TO REDUCE EMS TRANSPORT AMONG ASSISTED LIVING FACILITY RESIDENTS WITH SIMPLE FALLS: EVALUATION OF LONG-TERM OUTCOMES

Jefferson Williams, Lawrence Brown, Michael Bachman, Jose Cabanas, Alan Kronhaus, J. Bruce Myers, Wake County Department of EMS, UNC Department of Emergency Medicine CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: We previously showed shared decision-making between advanced practice paramedics (APP) and primary care physicians (PCP) could reduce EMS transports for assisted living facility (ALF) residents who experienced simple falls, without missing time-sensitive care. We hypothesized that there would be no difference in the 1-year risk of a second fall or death in fall-free survival time and overall survival time, between transported and non-transported patients. Methods: This secondary analysis used data from a retrospective cohort study of ALF patients with simple falls served by a single urban EMS system. APPs utilized history and exam criteria and consultation with an on-call PCP as necessary to decide transport vs. non-transport with close follow-up. Evaluated outcomes in this secondary analysis were: 1-year (second) fall risk, 1-year mortality risk, fall-free survival time, and overall survival time. The 1-year risk of a second fall or death was measured as events per person-year of follow-up and compared using incident risk ratio (IRR) with 95% confidence intervals (CI). One-year fall-free and overall survival time were measured in months and compared using Cox regression, with hazard ratios (HR) and CI reported. Results: Of 95 subjects enrolled in the primary study, 359 had a (first) fall: 130 (36%) were transported and 229 (64%) were not. Fifty-two transported subjects experienced a second fall within 1 year (HR 1.52). This analysis was limited to 1-year follow-up and does not include other potentially important outcomes such as resource utilization, hospitalizations, and/or costs. Conclusions: An EMS protocol allowing APP/PCP shared decision-making regarding transport for ALF residents with simple falls does not result in increased fall risk or mortality risk of a second fall or increased death rate, or shortened time to a second fall or death, over the ensuing 1-year period.

6. IDENTIFYING BARRIERS TO PREHOSPITAL ADVERSE EVENT REPORTING

Benjamin Weston, M Riccardo Colella, E Brooke Lerner, Tim Lenz, Matt Chin, Medical College of Wisconsin CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Despite attention focused on adverse events in medical practice, there remains a paucity of research into the nature and abatement of errors in EMS. While adverse events have been studied across the spectrum of EMS systems, they are infrequently reported in a systematic manner to assist in developing local mitigation strategies. However, integral to the development of such systems is an understanding of the perspective of providers on barriers to reporting adverse events. Objective: To determine the perceived barriers to EMS providers reporting adverse events. Methods: A voluntary, anonymous survey was sent to 879 providers across 5 different EMS agencies in southeastern Wisconsin. Completed surveys were mailed from urban and rural ground services to air medical programs. The survey was conducted using online software and was voluntary with electronic communication with a one-week follow-up reminder. The survey was developed using barriers that were previously identified by locally conducted focus groups. Data were analyzed using descriptive statistics. Results: The survey had an 63% response rate, with 550 surveys completed across the 5 agencies. Of those that participated, there were barriers to reporting adverse events. The most cited barriers were fear of blame or punishment from EMS agency (44% vs. 95% CI: 41.2–46.8%), concerns related to more bureaucracy/paperwork (32% vs. 95% CI: 26.1–37.2%), confusion on how to report errors (29% vs. 95% CI: 23.8–34.6%), responsibility of an overworked provider (22.6–33.5%), and fear of blame or punishment from medical director (17% vs. 95% CI: 12.2–21.0%). When results were separated by EMS agency type, we found that the primary concern was fear of blame or punishment from EMS agency for ground agencies and concern for more bureaucracy/paperwork for flight agencies. Conclusions: EMS providers uniformly identified several primary barriers to adverse event reporting. These barriers should be addressed when attempting to implement processes and programs to enhance adverse event reporting, as well as serve as a model for determining and addressing agency-specific issues.

7. EFFECTIVENESS OF PREHOSPITAL DUAL SEQUENTIAL DEFIBRILLATION FOR REFRACTORY VENTRICULAR FIBRILLATION AND VENTRICULAR TACHYCARDIA CARDIAC ARREST

Henry Wang, Lauren Beck, Daniel Oستermayer, Joseph Ponce, Saranya Srinivasan, Henry Wang, The University of Texas Medical School at Houston CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Dual sequential defibrillation (DSD)—successive defibrillation with 2 separate defibrillators—offers a novel approach to treating refractory ventricular fibrillation and tachycardia (VF/VT). The effectiveness of DSD is unknown. We evaluated the association of DSD with outcomes in refractory VF/VT out-of-hospital cardiac arrest (OHCA). Methods: We used data from Houston Fire Department, a large metropolitan fire-based EMS service. We included all adult OHCA during 2013–2016 with refractory VF/VT after 3 standard 360J defibrillations. We determined whether physicians authorized subsequent DSD use, consisting of rapid successive 360J rescue shocks delivered by 2 separate defibrillators (PAD control LIFEPAK 12/15) with pads placed in anterior-lateral and anterior-posterior configurations. Evaluation outcomes included return of spontaneous circulation
Background: Despite significant advances in resuscitation efforts, there are some patients who remain in ventricular fibrillation (VF) after multiple shocks during out-of-hospital cardiac arrest (OHCA). Double sequential external defibrillation (DSED) has been proposed as a treatment option for patients in shock refractory VF. Objective: To compare DSED to standard therapy with regards to VF termination and return of spontaneous circulation (ROSC) for patients presenting in shock refractory VF. Methods: We performed a retrospective review of all treated adult OHCA who presented in VF and received a minimum of two shocks over a one-year period beginning on January 1, 2015 in 6 Canadian EMS agencies. Using ambulance call reports and defibrillator files, we compared VF termination (defined as the absence of VF at the rhythm check following defibrillation and 2 minutes of CPR) and VF termination into a perfusing rhythm with ROSC and 2 minutes of CPR) and VF termination into a perfusing rhythm with ROSC and 2 minutes of CPR between patients who received standard therapy (CPR, defibrillation, epinephrine, and antiarrhythmics) and those who received DSED (after on-line medical consultation) for shock refractory VF (patients who presented in VF and did not terminate VF after 4 successive shocks). Cases of public access defibrillation, EMS witnessed arrest, and those who represented non-VF but terminated VF prior to 4 shocks were excluded. Results: Among 197 patients who met the study criteria for shock refractory VF, 161 (81.7%) patients received standard therapy and 36 (18.3%) patients received DSED. For the primary outcome, VF termination was significantly higher compared to standard therapy (63.9% vs. 18.0%; OR: 3.94, 95% CI: 0.92–16.35). For the secondary outcome of VF termination into ROSC, DSED was associated with significantly higher ROSC compared to standard care (33.3% vs. 13%; AOR: 0.33; 95% CI: 13.0–0.33). The median (IQR) number of failed standard shocks prior to DSED was 8 (6, 10). When DSED terminated VF, it did so with a single DSED shock in 69.6% of cases. Conclusions: Our observational findings suggest improved VF termination and ROSC are associated with DSED compared to standard therapy for shock refractory VF. An appropriately powered randomized controlled trial is required to assess the impact of DSED on patient-important outcomes.

9. DISPARITIES IN RECEIPT AND UTILIZATION OF TELECOMMUNICATOR CPR INSTRUCTION

Amanda Amen, Patrick Karabon, Cherie Bartram, Kevin Irwin, Robert Dunne, Margaret Wolff, Mohamud Daya, Kim Vellano, Bryan McNally, Robert Swor, Oakland University William Beaumont School of Medicine Category of Submission: Cardiac

Background: Telecommunicator Assisted Cardiopulmonary resuscitation (T-CPR) has been shown to be independently associated with improved survival and improved functional outcome after Out-of-Hospital Cardiac Arrest (OHCA). The objective of this study is to evaluate whether there are racial and socioeconomic disparities in the receipt of T-CPR instructions and subsequent CPR performance. Methods: This study is a retrospective review of a convenience sample of EMS agencies nationally that utilized the Cardiac Arrest Registry to Enhance Survival (CARES) dispatch registry during the period 1/2014–12/2017. Data was collected from a dispatch agency review of 9-1-1 OHCA audio recordings. Elements related to dispatcher CPR instruction, barriers to bystander CPR performance, patient race (Caucasian, African American, Hispanic-Latino, or other), and Utstein data were captured from the CARES database. This data was merged with census tract information from incident locations. The effects of race and income on outcome were analyzed using multilevel logistic regression. Results: A total of 3,552 cases were identified from 37 dispatch agencies in 6 states. The population was predominantly Caucasian (60.0%), male (64.9%), and median age of 60.4–19.8. In the adjusted analysis, for every $1,000 increase in Census Tract Income, the odds of receiving T-CPR instructions increased by 1% (OR: 1.01; p = 0.0011). African American patients had a 35% lower odds of receiving T-CPR as compared to Caucasian patients (OR: 0.65; 95% CI: 0.46–0.91). Subsequent utilization of T-CPR instruction for bystander CPR was also less likely for patients that had a lower income or who were African American. For every $1,000 increase in Census Tract Income, the odds of performing CPR increased by 1% (OR: 1.01; p = 0.0105). African American patients had a 37% lower odds of T-CPR utilization as compared to Caucasian patients (OR: 0.63; 95% CI: 0.41–0.99). Conclusions: Although this study is limited by incomplete demographic and dispatch data, we identified income and racial disparities in provision of T-CPR instructions and subsequent CPR performance in OHCA.

10. COMPARISON PEDIATRIC AND ADULT SIZED BAG-VALVE-MASK VENTILATION TO ACHIEVE APPROPRIATE TIDAL VOLUME IN SIMULATED ADULT OUT-OF-HOSPITAL CARDIAC ARREST IN MOVING AMBULANCE

Satthe Riyapan, Panumase Hirunwichayawat, Faculty of Medicine Siriraj Hospital, Mahidol University Category of Submission: Cardiac

Background: An appropriate ventilation is a key to success in resuscitation of out of hospital cardiac arrest (OHCA) patients. Previous study proposed that ventilation with pediatric sized bag-valve-mask (BVM) provided more appropriate tidal volume (Vt) for adult patients than adult sized BVM. However, the study was conducted in static simulated environment. We hypothesized that ventilation with pediatric sized BVM ventilation in moving simulated adult OHCA in moving ambulance. Therefore, the study compared pediatric and adult sized BVM ventilation in achieving appropriate Vt in simulated adult OHCA in moving ambulance. Methods: This was a randomized crossover trial. All participants performed both pediatric (500cc) and adult (1600cc) sized BVM ventilation during 30.2 chest compression and ventilation ratio in simulated OHCA on moving ambulance. Both scenarios utilized mechanical chest compression for controlling rate and duration of chest compression. The participants were asked to ventilate the adult sized manikin for 10 minutes during each scenario. The study measured appropriate Vt that defined as percentage of the ventilation volume ranged in basic life support (BLS) recommendation (400–600 mL) and ventilation rate between each scenarios. We also compared percentage of hypo and hyperventilation between each groups. Results: Fifty-two volunteers were included, 57.69% were registered nurses, 42.31% basic emergency medical technicians (EMT-B). Of all the volunteers, 84.62% were low experience in prehospital ventilation (<5 years). The mean Vt of pediatric size was 229.04 mL, whereas the Vt of adult size was 444.54 mL (P < 0.001). The average ventilation of pediatric size was 29.15 ± 1.35 ventilations, whereas adult size was 43.84 ± 9.25 ventilations (P < 0.001). Adult sized BVM was 100% hypoventilation; however, the adult sized was 52.13 ± 25.63% appropri- ate ventilation, 11.35 ± 18.59% hyperventilation; and 36.54 ± 29.11% hypoventilation (P < 0.001). Conclusions: A comparison of pediatric and adult sized BVM ventilation in simulated adult OHCA patients in moving ambulance demonstrated a superiority of adult sized BVM over the pediatric sized BVM in appropriate both Vt and ventilation as BLS recommendation guideline.

11. VENTILATION VARIABILITY IN SIMULATED OUT-OF-HOSPITAL CARDIAC ARREST RESUSCITATION

Jason McMullan, Samuel Farmer, Uwe Stoelting, Justin Bennett, University of Cincinnati Category of Submission: Cardiac

Background: While airway management and chest compressions have been widely studied, ventilation characteristics during out-of-hospital cardiac arrest (OHCA) resuscitations have been poorly described and routinely limited to respiratory rate (RR). Total published experience with tidal volume (TV) is a series of 12 subjects, and minute ventilation (MV) has never been measured. We hypothesized that ventilation parameters (TV and MV) vary during simulated OHCA resuscitations. Methods: On-duty fire department teams of 4 EMS providers (mixed EMTs

ROSC, survival to hospital admission, sur- vival to 72 hours, and survival to hospital dis- charge were modeled by multivariate linear regression, we evaluated the associations between defibrillation type (DSD vs. conven- tion) and OHCA outcomes, adjusting for age, sex, bystander CPR, and initial ECG. Results: We included 310 patients in the analysis, including 71 patients receiving subsequent DSD and 239 receiving convention defibrillation. Defibrillation outcome, patient demographics and event characteristics were similar between DSD and conventional defibrillation. ROSC was lower for DSD than standard defibrilla- tion (39.4%, adjusted OR 0.46 (95% CI: 0.25–0.87)). There were no differences in survival to hospital admission (35.2% vs. 49.2%, adjusted OR 0.57 (95% CI: 0.30–1.08)), survival to 72 hours (21.4% vs. 32.3%, adjusted OR 0.52 (95% CI: 0.26–1.10)), or survival to hospital discharge (14.3% vs. 20.9%, adjusted OR 0.63 (95% CI: 0.27–1.45)). Conclusions: Compared with conventional defibrillation, DSD was associated with lower odds of ROSC. Defibrillation type was not associated with other OHCA endpoints, DSD may not be beneficial in refractory VF/VT OHCA.

8. DOUBLE SEQUENTIAL EXTERNAL DEFIBRILLATION IMPROVES TERMINATION OF VENTRICULAR FIBRILLATION AND RETURN OF SPONTANEOUS CIRCULATION IN SHOCK-REFRACTORY OUT-OF-HOSPITAL CARDIAC ARREST

Sheldon Cheskes, Shelley McLeod, Jim Summers, Laurie Morrison, Alexandra Wudwud, P Richard Verbeek, Rescu Investigators Rescu, Sunnybrook Centre for Prehospital Medicine Category of Submission: Cardiac

Background: While airway management and chest compressions have been widely studied, ventilation characteristics during out-of-hospital cardiac arrest (OHCA) resuscitations have been poorly described and routinely limited to respiratory rate (RR). Total published experience with tidal volume (TV) is a series of 12 subjects, and minute ventilation (MV) has never been measured. We hypothesized that ventilation parameters (TV and MV) vary during simulated OHCA resuscitations.
and paramedics) participating in a standar-
dized simulation of EMS-witnessed adult OHCA,
that the study was taking place. The team prospectively
observed a consecutive series of resuscita-
tions from a control room. Proctors pro-
vided feedback on ventilations to maintain blind-
ing. Laerdal SimMan 3G and DebriefViewer software recorded ventilation characteristics. Goal RR was defined as 8–10/min reflecting current guidelines. DebriefViewer designates ideal TV as 400–700mL. We report summary statistics with standard deviations (SD) and 95% con-
fidence intervals (CI). Pearson’s correlation coefficient was used to determine the corre-
lation between variables. Results: We observed 22 simulations totaling 158 minutes with a mean of 7.2 (SD 2.7) min/simulation. The mean RR was 5.6 respirations/min (95% CI: 4.5–6.7). Only 4 (18%) simulations were within the target ventilation range (8–10/min), with 17 (77%) simulations below and 1 (5%) above. The mean TV per ventilation across all simulations, 13% were below the target volume (400–700mL) and 46% were above. Three simulations (14%) had both a mean RR and TV below target. Minute ventilation ranged from 0.7 to 8.8L/min with an overall mean of 3.7 (95% CI: 2.8–4.6). The Pearson’s correlation coefficient between TV and RR was 0.32.

Conclusions: We show that it is feasible to develop a high-performing, automated class-
sification system using EMS clinical notes to streamline the identification of patients for prehospital trials. We intend to use this approach in conjunction with a feedback loop to enhance enrollment for multi-site prehospital trials.

13. ASSOCIATION BETWEEN OCCUPATIONAL BURNOUT AND TURNOVER, SICKNESS ABSENCE, AND INJURY AMONG EMS PROFESSIONALS

Remle Crowe, Rebecca Cash, Madison Rivard, Ashish Panchal, Jonathan Studnek, Patricia Dowbiggin, Sarah Anderson, Tony Hogan, Rebecca Andridge, Amy Ferketich, The National Registry of EMTs, The Ohio State University College of Public Health category of submission: operations, quality, safety system

Background: Cross-sectional studies have linked burnout to forms of job withdrawal including absenteeism and turnover in EMS; however, not all people experiencing burnout leave the organization. Burnout at work may engage in shortcuts to reduce job demands, which could lead to occupational injury. Our objective was to prospectively assess the relationship between turnover, sickness absence, and occupational burnout among EMS professionals. We hypothesized burnout is linked to increased turnover, absenteeism, and injury. Methods: We conducted a prospective cohort study of EMS professionals working for a large muni-
cipal EMS agency. Participants were followed for a 6-month period (December 1, 2016–July 1, 2017). Work-related burnout was assessed at baseline using the Copenhagen Burnout Inventory. Turnover, sickness absences, and occupational injuries were obtained from agency records. Five or more sickness absences in the 6-month period was classified as high absenteeism based on estimates from the Bureau of Labor Statistics. Generalized linear models with robust standard error esti-
mates were used to calculate risk ratios (RR, 95% CI) comparing providers experiencing burnout to those who were not. Results: A total of 2,012 EMS professionals responded to the baseline questionnaire. Nearly half (48%, N = 112) of participants were experiencing at least one type of burnout (out of baseline, n = 16) of all participants had left the agency, 47% (n = 110) took 5 or more sick days, and 11% (n = 26) incurred at least one occupational injury. The risk of leaving the agency was nearly three-fold higher among those experi-
encing work-related burnout also demonstrated 75% greater risk of incurring 5 or more days of sickness absence (1.75, 1.28–2.39). Future larger-scale prospective work is needed to examine the potential association between burnout and injuries.

14. HELPING THOSE WHO HELP: PERSONALITY, STRESS, COPING, AND SOCIAL SUPPORT IN CANADIAN PARAMEDICS

Joanna Lockhart, Stephen Perrott, Emergency Health Services Nova Scotia, Mount Saint Vincent University category of submission: professional

Background: Support services and psycho-
logical interventions available to paramedics are largely adopted from other occupational groups, notably combat military personnel, police, and firefighters. In doing so, these interventions assume equiva-
 lent work experiences and shared psycho-
logical states on stress-relevant constructs. Considering the prevalence of mental health problems experienced by paramedics, research focused exclusively on the potentially unique personality characteristics, coping styles, and perceptions of social support of paramedics is needed to provide a foundation for developing the most efficacious support services to amel-
iorate stress reactions. Purpose: The primary objective was to collect descriptive data related to these psychological constructs and to exam-
ine the utilization of, and satisfaction with, cur-
rently available support services intended to manage psychological distress. A secondary goal was to investigate which of the assessed variables predict perceptions of social support at the individual level. Methods: An internet-based survey was distributed to 1,348 paramedics in the province of Nova Scotia, and responses from 344 para-
medics were analyzed. The survey included a Big-Five measure of personality and indices of social support, coping and perceived stress. Results: When compared to a normative sam-
ple, paramedics were higher in Conscientiousness, Extraversion, and Agreeableness and lower in Open-Mindedness and Negative Emotionality (all p < .001). Greater levels of perceived stress (R2 = .438) and utilization of both healthy (p < .001) and less-than-optimal (p < .001) coping strategies were reported. Strikingly low perceptions of social support were observed (p < .001). Negative Emotionality was the strongest per-
sonality predictor of perceived stress (R2 = .438) and Less-Useful Coping and per-
ceptions of social support (R2 = .380) were the top two personality predictors. Conclusions: Results suggest that respondent paramedics experience inordinately high levels of stress with a predisposed state of considerable psy-
chological resiliency. Given that data suggests a psychologically healthy group reports such high levels of perceived stress likely belies even greater levels workplace stress than reported scores suggest. Future work examining the relationship between social support and perceived stress, against the backdrop of lower than normative perceptions of support overall, are the findings

and medic (NLT) for the bag of words model to assist in feature extraction. The performance was validated on gold-standard manual review by experts, mean average precision, recall, and F1-score were assessed. Results: Compared with the case without automation, the workload with automatedeligibility screening was reduced by 99% on the gold standard set. We identified 9,113 features within the clinical notes that were used to train the models that were compared using mean average precision, recall, and F1-score. We compared 4 machine learning algorithms of Naïve Bayes, Support Vector Machine (SVM), logistic regression, and random for-
tree decision tree. Empirical findings indi-
cated that the SVM and Random Forest approaches outperformed all other classi-
fiers achieving precision scores of 0.88 and 0.89, recall scores of 0.91 and 0.92, and F1-
scores of 0.88 and 0.90, respectively. Conclusions: We show that it is feasible to develop a high-performing, automated clas-
sification system using EMS clinical notes to streamline the identification of patients for prehospital trials. We intend to use this approach in conjunction with a feedback loop to enhance enrollment for multi-site prehospital trials.
15. DEPENDENCE ON OVERTIME OR MULTIPLE JOBS IS ASSOCIATED WITH WORKFORCE-REDUCING FACTORS AMONG EMS PROFESSIONALS

Madison Rivard, Rebecca Cash, Ashish Panchal, National Registry of Emergency Medical Technicians Categorization of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: EMS professionals frequently work standard 40-hour workweeks. For some EMS professionals, working overtime or multiple jobs may be necessary to make ends meet. It is unclear the impact on EMS professionals’ job satisfaction and intent to leave a job if they depend on overtime pay or multiple jobs. Our objective was to evaluate the association between job satisfaction, intention to leave, and dependence on overtime or working multiple jobs. We hypothesized that dependence on overtime or multiple jobs is associated with low job satisfaction and an increased intent to leave EMS. Methods: This was a cross-sectional survey of nationally-licensed EMS professionals. After recertifying their National EMS Certification, EMS professionals were invited to complete a survey with questions regarding their dependence on overtime or multiple jobs, job satisfaction, and intention to leave EMS assessed on 4-point Likert scales. Three hundred fifteen forms were returned (response rate = 21%). Of these respondents, 71% stated they depended on overtime or multiple jobs to make ends meet. This differs by certification level with 65% of EMTs dependent on overtime or multiple jobs compared to 75% of paramedics (p < 0.001). Respondents who depended on overtime or multiple jobs had a 17% increase in odds of being dissatisfied with their job (2.18, 1.88-2.53). Similarly, those who depended on overtime or multiple jobs had increased likelihood of intending to leave EMS within the next 12 months (1.43, 1.23-1.65) or 5 years (1.42, 1.15-1.34). Conclusions: In this sample, many EMS professionals depended on additional work hours or multiple jobs. This economic dependence was associated with job dissatisfaction and intention to leave EMS. Future work should focus on improving pay and benefits for EMS professionals to decrease turnover.

16. EXPLORATORY STUDY OF THE ROAD TO MENTAL READINESS PROGRAM WITHIN EMERGENCY MEDICAL SERVICES PERSONNEL IN ALBERTA HEALTH SERVICES

Jabin Binnendyk, Jamie Prowse-Turner, Ian Blanchard, Chris McIntosh, Scott Oddie, University of Calgary Category of Submission: STUDENT, RESIDENT, FELLOW

Background: Occupational Stress Injuries (OSIs), such as post-traumatic stress disorder, among Emergency Medical Services (EMS) personnel produce a public-safety concern and negatively impact resiliency and workplace mental health. In response, the Mental Health Commission of Canada modified and deployed a program created by the Canadian military called Road to Mental Readiness (R2MR), which was shown to be implemented among some EMS services. The R2MR program aims to enhance resilience and help-seeking behaviours while reducing stigma, although sparse empirical evidence currently confirms its effectiveness. PURPOSE: To determine if R2MR retention produced differences in resilience, help-seeking behaviors, and stigma. Methods: An online survey was made available to all operational and management personnel in a provincial EMS system serving approximately 4 million people. Retention of R2MR was defined as the ability to recall R2MR components and assessed using knowledge-based questions while resilience, help-seeking behaviors, and intention to leave EMS assessed on 4-point Likert scales. This simulation score, management and self-efficacy were univariately compared between Time0 and Time1. Results: A total of 292 PHPs participated in 49 simulations at Time0 with 179 PHPs participating in 40 simulations at Time1 (65% ALS [advanced life support], 35% BLS [basic life support]). Inter-rater reliability for video simulation score improved from Time0 to Time1 (24 vs. 27, p = 0.04) with greater improvements in recognition and management of respiratory depressions. Scales for decision making and the administration method (pull-push 44% vs. 75%, p = 0.03) and administration of correct dose of medications (75% vs. 100%, p = 0.02) improved. Self-efficacy, and increased resiliency (p < 0.001; 95%CI: 0.02, 3.84) along with confidence in decision making (p = 0.047; 95%CI: 0.02, 3.84) increased. Further studies are needed to determine if improvement is sustained over time.

17. PREHOSPITAL EMERGENCY ASSESSMENT OF KIDS (PEAK) PERFORMANCE

Kathryn Rappaport, Chelsea Zuger, Neil Deasi, Michelle Allitag, Ashley Bakala, Sean Caffrey, Jan Leonard, Kelley Roswell, Patrick Mahar, Kathleen Adelgais, University of Colorado School of Medicine Category of Submission: PEDIATRIC

Background: Prehospital providers (PHPs) infrequently transport children leading to difficulty recognizing pediatric critical illness, maintaining management competency and high rates of medication error. Simulation provides a venue to assess the management of pediatric critical illness, however the impact of serial simulations on improving management is unknown. The objective of this study is to examine performance and self-efficacy on serial simulations of pediatric emergencies. Methods: Teams of 4-5 PHPs from one urban fire agency participated in 2 high-fidelity simulations 3 months apart. The initial case (Time0) simulated a 15 month-old seizure and the second case (Time1) simulated a 1 month-old with hypoglycemia. Both cases required management of respiratory failure, decompensated shock, and medication administration. Two investigators scored simulations via video review using a validated scoring tool assessing team-based care (total possible score: 42). Inter-rater reliability for video review was good (k = 0.7). Median simulation score, management, and self-efficacy were univariately compared between Time0 and Time1. Conclusions: Serial simulations improved PHP pediatric critical illness management and self-efficacy, decreased medication errors and improved method of fluid administration. Additionally, PHP self-efficacy increased. Further studies are needed to determine if improvement is sustained over time.
suggestions that CP practice and educational needs can be organized into 18 first-order concepts. CPs require enhanced knowledge, strong clinical decision-making skills, enhanced assessment and diagnostic skills, and they offer specific therapies. CPs must be skilled at relationship-building, multidisciplinary collaboration and health system navigation. CPs should offer preventive healthcare, facilitate access to care, and ensure quality care. CP training should have a formal component, incorporate information management training, involve trainers from multiple healthcare disciplines, and facilitate continuous professional opportunities. CPs also require accreditation consistent with their unique scope of practice and patient population. Second order themes fall surprisingly in parallel with the educational needs of medical resident trainees as identified in the CanMEDS Competency Framework: medical expert, communicator, collaborator, leader, health advocate and professional.

Conclusions: Community Paramedics must have a very broad skillset if they are to meet the range of healthcare needs that exist among various communities. We suggest that CPs must work with regulators and educators toward further defining core CP practice and become highly skilled at interfacing with other members of the healthcare team.

19. USING PREHOSPITAL SCREENING TOOLS TO IDENTIFY LARGE-VESEEL OCCLUSION

Peder Humlen-Ahearne, Larry Hadland, Lawrence Brown, Remle Crowe, Ada County Paramedics Category of Submission: MEDICAL

Background: Stroke screening tools used by U.S. EMS systems vary widely, but common tools include FAST, CPSE, LAPSS, PASS, RACE, LAMS, and VAN. The recent advent of cerebral endovascular mechanical thrombectomy as a treatment option for large vessel occlusions (LVO) has highlighted the need for prehospital stroke screening tools that reliably identify LVO.

The purpose of this analysis was to determine test characteristics for commonly used prehospital stroke scales for detecting LVO.

Methods: This retrospective analysis included all patients with both a stroke screening and health data exchange (HDE) history and included all in a 12-month calendar year 2017 database maintained by a single, large commercial electronic patient care reporting (ePCR) provider. LVO was identified using ICD-10 diagnosis and procedure codes (I63.239; I63.411; I63.22; OSCNG32Z). We evaluated sensitivity, specificity and positive/negative predictive values (PPV/NPV) for RACE or LAMS score ≥4 (the only 2 scales with established cut points for LVO); we also predicted values (PPV/NPV) for RACE or LAMS score ≥4 stroke-screening tools or 2 or more screening characteristics by EMS is a poor predictor of presence of LVO in cerebral occlusions. Further efforts are needed to expand and further evaluate the prehospital use of RACE/LAMS for identifying LVO and to establish the LVO-identifying aspects of other common prehospital stroke scales.

20. IS USE OF WARNING LIGHT AND SIRENS ASSOCIATED WITH INCREASED RISK OF AMBULANCE CRASHES? A NATIONAL ANALYSIS

Gregory Patterson, Brooke Watanabe, Orlando Magallanes, James Kempema, Lawrence Brown, Dell Medical School at the University of Texas at Austin Category of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: No previous studies have explored the crash risk associated with ambulance use of lights and sirens (L&S) on a broad, national scale. The purpose of this study was to compare reported crash rates for U.S. ambulances responding to, or transporting patients from a 9-1-1 emergency scene with or without L&S. Our null hypothesis was that there would be no difference in the rate of ambulance crashes when using or not using L&S.

Methods: We used the National EMS Information System (NEMSIS) Dataset for 2016 to identify 9-1-1 scene responses and subsequent patient transports by transport-capable EMS units (excluding LSV and flights). We used the NEMSIS “Response Mode to Scene” and “Transport Mode from Scene” fields to determine L&S use. We used the “Type of Response Delay” and “Type of Transport Delay” fields to identify responses and transports that were delayed due to a crash involving the ambulance. We calculated the rate of crash-related delays per 100,000 responses or transports. We used multivariable analyses with agencies treated as clusters to adjust for EMS system characteristics and covariates of interest. We use adjusted odds ratios (AOR) with 95% confidence intervals (CI) to compare the rate of crash-related delays among responses and transports with and without L&S. We also conducted sensitivity analyses excluding responses and transports for which L&S were used for part, but not all, of the response or transport.

Results: Among 19 million 9-1-1 scene responses by transport-capable EMS units, the response phase crash rate was 4.6/100,000 without L&S and 5.4/ 100,000 with L&S (AOR = 1.31; CI: 1.03-1.67). For the transport phase, the crash rate was 7.0/100,000 without L&S and 17.1/ 100,000 with L&S (AOR = 3.17; CI: 2.53-3.96). Excluding responses and transports with patient exposure, the crash rate meaningfully altered the RESULTS (response: AOR = 1.37; CI: 1.07-1.75; transport: OR = 3.14; CI: 2.49-3.97).

Conclusions: Ambulance use of L&S was associated with increased ambulance-involved traffic crashes. The association is strongest during response transports. The association is quite apparent in response transports by transport-capable EMS units, the response phase crash rate was 4.6/100,000 without L&S and 5.4/ 100,000 with L&S (AOR = 1.31; CI: 1.03-1.67). For the transport phase, the crash rate was 7.0/100,000 without L&S and 17.1/ 100,000 with L&S (AOR = 3.17; CI: 2.53-3.96). Excluding responses and transports with patient exposure, the crash rate meaningfully altered the RESULTS (response: AOR = 1.37; CI: 1.07-1.75; transport: OR = 3.14; CI: 2.49-3.97).

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NAEMS 2019 Annual Meeting Abstracts

RESULTS: There were 125 respondents to the survey. The majority of respondents feel that handoff communication needs improvement (106, 85%). Approximately half of those that responded received formal training on handoffs (60%, 48%). Most of respondents do not currently use any standard handoff (103, 82%). Qualitative analysis revealed the perspectives of paramedics and EM physicians were overwhelmingly similar. Five encompassing themes emerged as having the largest impact on handoff: Communication, Teamwork, Competence, Handoff Encounter, and Systems. Under the umbrella of each theme, numerous factors and subfactors influence patient handoff; many behaviors, if done well, promote effective handoffs, whereas when done poorly, are a barrier to the patient handoff. Communication included verbal and nonverbal face-to-face communication, written documentation, and radio report timing and characteristics. Teamwork factors included trust and respect, rapid and receptive to EMS, empathy, and handling mistakes. Conclusions: The patient handoff is affected by a variety of factors. This framework adds to the existing literature, highlighting that interdisciplinary and inter-system collaboration are needed. It can be used to guide multidisciplinary training, modify or enhance handoff tools, and direct system-based solutions. A multipronged approach is required to improve handoff processes in clinical practice.

23. IMPLEMENTATION OF AN EVIDENCE-BASED ASSESSMENT TOOL BY COMMUNITY PARAMEDICS TO REDUCE EMERGENCY RESOURCE USE IN PATIENTS WITH COMPLEX NEEDS

Erin Weldon, Neil McDonald, Rob Grierson, Ryan Sneath, Phil Hutlee, Nelia Cooper, Aaron Bannister, John Lane, University of Alberta

Background: Patients with complex medical and social needs are at risk for increased ambulance and emergency department (ED) usage. Community paramedics in our service have successfully reduced 9-1-1 calls and ED visits among these clients. We introduced an evidence-based, validated community assessment tool on a trial basis. This pilot study evaluates the effect of this process change on emergency-resource recidivism in a group of patients with active and predicted frequent usage.

Methods: This was a retrospective before-and-after study assessing the implementation of the interRAI Community Health Assessment (CHA) by community paramedics. Primary outcome measures were 9-1-1 calls and ED visits, assessed 6 months pre and post intervention. Secondary outcomes included the number, type, and time to treatment of out-of-region supplementary community services. Historic medical data and base-line demographics were also collected. Paired differences were analyzed using the Wilcoxon signed-rank test. Descriptive statistics were used to describe outcomes in frequent users vs. those at risk for frequent use.

Results: A total of 20 clients were assessed in the study period (12 female). The mean age was 67.0 (SD 10.7, median 65.7). Median decreases from pre to post intervention were 3.0 (9-1-1 calls and 5.0 ED visits (p = 0.0055) 6 months before and after assessment were observed. Post intervention, 13 of 20 clients received supplementary community services at an average time from referral to service implementation of 11 business days (SD 12). This group showed median decreases of 8.0 911 calls (p = 0.0039) and 5.0 ED visits (p = 0.0044) 6 months before and after service implementation. When clients were grouped by their prior history of resource use, active frequent users (n = 82) showed decreases than those at risk of frequent use in all categories post intervention: 9-1-1 calls (8.0 vs. 1.0) and ED visits (6.0 vs. 0); and 9-1-1 calls (8.5 vs. 3.0) and ED visits (7.0 vs. 4.0).

Conclusions: This study demonstrates a significant reduction in 9-1-1 calls and ED visits among clients with complex needs after implementing the interRAI CHA. This study will further investigate the increased impact of the intervention in highly frequent users versus those at risk for frequent use.

24. DETERMINING AMBULANCE DESTINATIONS IN THE PRESENCE OF AN OFFLOAD DELAY USING A MARKOV DECISION PROCESS

Mengyu Li, Peter Vanberkel, Dalhousie University Category of Submission: Student, Resident, Fellow

Background: When emergency departments (EDs) are crowded and cannot accept incoming ambulance patients immediately, paramedics will commonly continue to provide patient care until an ED bed becomes available. This delay in transferring a patient to the ED is referred to as ambulance offload delay (AOD). AOD is a pressing problem for Emergency Medical Services (EMS) systems as it negatively affects ambulance availability and patient safety. The objective of this study is to develop a method to determine which hospital (including out-of-region hospitals) to send patients to in the presence of AOD. It aims to provide trip destination guidelines to EMS to improve the effects of AOD.

Methods: A retrospective analysis of all emergency responses in a mixed urban/rural setting (where AOD is commonly experienced) between January 2016 and December 2016 was performed. Operational (ambulance location, times) and patient (acuity) data were obtained from Computer aided dispatch (CAD) and electronic patient care reporting (ePCR) records. Inclusion criteria were any emergency response that led to transport to an ED. A discrete time, infinite-horizon, discounted Markov Decision Process (MDP) model was formulated to determine when it is advantageous to send appropriate patients to out-of-region EDs, which have longer transport times but shorter offload times. Results: The study includes 22,243 patient transports to in-region EDs and 2,243 patient calls that result in patient transportation to an ED. At the time of ambulance offload, 70.8% of patients were admitted to in-region EDs, 28.9% were admitted to out-of-region EDs, and 0.3% were discharged. The average highest documented pain score was 8.84. Compared with young adults (age 18–29 years), children were less likely to receive analgesia (OR: 0.57, 95% CI: 0.45–0.70). Older patients (≥70 years) were more likely to receive analgesia (OR: 1.18, 95% CI: 1.10–1.26). Males were more likely to receive analgesia (OR: 1.23, 95% CI: 1.19–1.29). Patients identified as Black or African American were more likely than White, non-Hispanic patients to receive analgesia (OR: 0.60, 95% CI: 0.56–0.63). Compared with the West census region, injury patients in the Northeast were less likely to receive analgesia (OR: 0.53, 95% CI: 0.44–0.63), while those in the South were more likely to receive analgesia (OR: 1.16, 95% CI: 1.10–1.27). Conclusions: EMS analgesia administration differs by age, sex, race, and region. Furthermore, EMS management of pain secondary to traumatic injury using analgesic medications was below 10% overall. These results highlight opportunities for improving EMS analgesia administration practices.

25. DEPARTURES IN PREHOSPITAL ANALGESIA FOR TRAUMA PATIENTS IN THE UNITED STATES


Background: Management of pain is an important treatment goal for severe injuries. Only limited data describe disparities in Emergency Medical Services (EMS) management of pain secondary to traumatic injury using analgesic medications from the ESO research database containing electronic patient care records from over 900 EMS agencies. We included 9-1-1 responses with historical medical data and base-line demographics of trauma patients with a documented pain score ≥7 (on a 1–10 scale). The primary outcome was administration of ≥1 analgesic medications. Using multivariable logistic regression, we determined the independent associations between analgesia and age category, sex, race, and census region.

Methods: Of 119,207 injured patients with pain score ≥7, 10,377 (9%) received analgesia. The mean age among this injured patient population was 50 years and 43% were male. The average highest documented pain score was 8.84. Compared with young adults (age 18–29 years), children were less likely to receive analgesia (OR: 0.57, 95% CI: 0.45–0.70). Older patients (≥70 years) were more likely to receive analgesia (OR: 1.18, 95% CI: 1.10–1.26). Males were more likely to receive analgesia (OR: 1.23, 95% CI: 1.19–1.29). Patients identified as Black or African American were more likely than White, non-Hispanic patients to receive analgesia (OR: 0.60, 95% CI: 0.56–0.63). Compared with the West census region, injury patients in the Northeast were less likely to receive analgesia (OR: 0.53, 95% CI: 0.44–0.63), while those in the South were more likely to receive analgesia (OR: 1.16, 95% CI: 1.10–1.27). Conclusions: EMS analgesia administration differs by age, sex, race, and region. Furthermore, EMS management of pain secondary to traumatic injury using analgesic medications was below 10% overall. These results highlight opportunities for improving EMS analgesia administration practices.
Mechanism” is highly prevalent in sports. Our objective was to compare the CCR performance in non-sport-related injuries and describe sport-related mechanisms of injury. Methods: We reviewed data from the prospective para-
medical care implementation study in 7 Canadian cities, which already included identification of sport-related inju-
ries. A single trained reviewer further categorized mechanisms of injury using a pilot-tested standardized form, with the aid of a
sport medicine physician in 15ambiguous cases.
We compared the CCR’s recommenda-
tions for immobilization versus non-
sport-injured patients using chi-square and rela-
tive risk statistics with 95% confidence in-
tervals. Results: There were 201 amateur sport-injuries among the 5,978 patients. Sport-injured patients were younger (mean age 36.2 vs. 42.4) and more predominantly male (65.5% vs. 46.8%) than non-sport-
injured patients. Paramedics did not miss any c-spine injuries when using the CCR. Although cervical spine injury rates were similar between sport (2/201; 1.0%) and non-
sport (2/777; 0.3%) cases, the absolute number of sport-related injuries was very small. Although CCR recommended immobilization equally between the 2 groups (46.5% vs. 48.1%), RR 1.17 (95% CI, 0.85–1.57) the recommendation for immobilization was more likely to be a dangerous mechanism in
sport injuries (68.6% vs. 54.5%, p=0.03). Although, we observed a wide range of mechanisms, the most common dan-
ergous mechanism responsible for immobil-
zation in sport was axial load. Conclusions:
The CCR identified all significant c-spine injures in collegiate or pro athletes evaluated by sport medicine
therapists and physicians, as these patients are rarely assessed by paramedics or trans-
port personnel. This does support the safety and benefit of using the CCR in sport in-
injured patients for which paramedics are called.

27. End-Tidal CO2 Monitoring in Non-
Intubated Traumatic Brain Injury: Patients Receiving O2 via Nasal Cannula versus Non-
Rebreather Mask

Bruce Barnhart, Daniel Spalte, Eric Helfenbein, Saeed Babaeizadeh, Dawn Jorgensen, Chengcheng Hu, Amro Rice, Samuel K., Octavio Xerez, The University of Arizona CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: The advent of highly sensitive
End-Tidal CO2 (ETCO2) sensors allows effective
monitoring of intubated patients in many
emergency care settings, including EMS. Previous work has explored the use of ETCO2 monitoring in non-intubated patients with sensors placed in the nares. However, nothing is known about the effect of passive oxygen delivery [nasal cannula (NC) or non-
rebreather mask (NRB)] on ETCO2 measure-
ment. Objective: To compare ETCO2 measure-
ments in non-intubated Traumatic Brain Injury (TBI) patients receiving O2 via NC vs. NRB in the prehospital setting. Methods: A subset of major TBI cases (CDC Barell Matrix Type 1) in the Excellence in Prehospital Injury Care (EPIC) TBI Study (NIH/NINDS-
R01NS071065 NCT01339702) were evaluated 4/13–3/17. Non-intubated cases from 6 Arizona EMS agencies providing monitor data (Philips MRx or Siemens ETCO2) were included. ETCO2 data were available. Beginning and ending ETCO2 readings were excluded from analysis. Time to tourniquet application compared to written only. It also suggests that just in time training does improve effectiveness of tourniquet application compared to previous higher data. Furthermore, this is suggested to be needed to assess the effectiveness of audio alone. Limitations to the study are the geo-
graphic sample and size of the sample.

29. ACCURACY OF CARBONYLHEMOGLOBIN SPOT-CHECK WITH A NEW PULSE OXIMETER IN THE PRESENCE OF HYPOXIA

David MacLeod, Maria Antoinette Santoro, Zachary Augustine, Marcus Kramer, Human Pharmacology & Physiology Lab (HPPL), Dept of Anesthesiology, Duke University CATEGORY OF SUBMISSION: MEDICAL

Background: Unintentional, non-fire-related carbon monoxide (CO) is responsible for approximately 15,000 emergency department visits and nearly 500 deaths annually in the United States. CO binds to hemoglobin (Hb) forming carboxyhemoglobin (COHb) and displaces oxygen thereby pro-
ducing hypoxemia. Early COHb identifica-
tion is critical for rapid patient triage and treatment. Typical pulse oximeter technology cannot measure COHb and, invasive, time-consuming arterial blood gas (ABG) measurements are required to confirm COHb. Recent advances in pulse oximeter technology have created systems capable of noninvasive COHb monitoring. However, these systems’ accuracy during spot-check-
ing, as used in the prehospital setting, have not been assessed in a controlled prospective study. The objective of this study is to eval-
uate the spot-check accuracy of a new nonin-
vasive system for COHb monitoring.

Methods: Following IRB approval, consent and screening, healthy volunteers were recruited for a prospective, non-blinded, randomized study. Each subject received in-lab dosing of CO (COHb ranging from 0–15%) with concurrent desaturation (Sao2 range of 80–100%) controlled by inhala-
gon gas mixtures. Stable gas plates were held for ABG sample collection and evalu-
ation (ABL90, Radiometer). During the pla-
teus, multiple COHb noninvasive sensors (SenSorex, Multi-Sensing Oximetry System, Nonin Medical) were exchanged at 60-second intervals on the non-articular hand to replicate a spot-check use case. Spot-check performance was measured using the accuracy root mean square difference (95% confi-
dence interval), sensitivity and specificity comparing arterial and noninvasive COHb estimates. Results: 10 subjects (7M, Aged: 21–50, BMI: 20.9–29.2 Kg/m2) completed the study with a total of 169 blood samples drawn. The ARMS of COHb spot-checking, during CO exposure and normoxia, was 2.2% [1.94%, 2.45%]. Concurrent hypoxia significantly degrade the COHb measure-
ment, producing an ARMS of 2.5% [2.28%, 2.75%]. CO exposure in excess of a 10% clin-
ical threshold was detected with 95% sensitivity and specificity of 93%. Conclusions: This study demonstrated a satisfactory accur-
acy, sensitivity and specificity for the
Background: Unbiased estimates for field triage scheme (FTS) guideline performance are important for evidence-based system design and improving outcomes for seriously injured patients. Traumatic brain injury (TBI) is the crucial injury for mortality and disability, and 6–15% of acute patients require immediate transportation with optimal prehospital care to trauma centers. The prediction outcomes of each triage component in the FTS has not been evaluated for TBI. This study aimed to estimate the prediction performance of each component of FTS on hospital outcomes in TBI patients.

Methods: This is a cross-sectional observational study using a nationwide emergency medical services (EMS)-treated severe trauma (EMS-ST) database in 10 provinces Korea in 2013. All EMS-ST with traumatic brain injury selected by ICD-10 codes (S06.1–S06.9) were analyzed. The main exposure was each component of field triage scheme set by the Centers for Disease Control and Prevention of US (2012 version) as determined by EMS provider at the field. The outcomes were hospital mortality and disability (newly developed or worsened disability) at discharge, measured with Glasgow Outcome Scale (GOS). Sensitivity, specificity, and the area under the curve (AUC) was calculated. Results: 105,184 patients met the FTS guidelines. Of these, 21.5% died, and 51.4% of patients got disability. The sensitivity and specificity for mortality of the physiologic, anatomic, and mechanical criteria were 91.4% and 47.3%, 20.0% and 93.15%, and 57.8%, and 89.3%, respectively. Among each component of criteria, altered mentality showed highest sensitivity and AUC for mortality, which was 89.2% (95% CI: 87.4–91.0) and 0.699 (95% CI: 0.687–0.711). Amputation and chest wall instability in physical criteria showed highest specificity for mortality, 99.8% (95% CI: 99.5–99.9) and 99.9% respectively. The altered mentality showed highest sensitivity and AUC for disability, which was 75.9% (95% CI: 74.3–77.7%) and 0.671 (95% CI: 0.658–0.684), respectively. Conclusions: The physiologic criteria of field triage guidelines showed high sensitivity for prediction of mortality. Anatomic and mechanical criteria showed low sensitivity and specificity for mortality and disability. The altered mentality of physiologic criteria showed highest sensitivity and AUC among FTS components.

32. CHARACTERISTICS OF MEDICAL DIRECTOR REGULATION AT THE STATE AND TERRITORY LEVEL

Betty Yang, Emily Gibbons, Ashish Panchal, Ohio State University Wexner Medical Center CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: The HEARTSafe Communities program attempts to strengthen the American Heart Association “chain of survival” by promoting efforts of communities to improve their systems of treating sudden cardiac arrest (SCA). The program was founded in 2002, and has representation in 16 states. This study examined whether SCA survival rates differ between towns that do and do not have the HeartSAFE designation in Connecticut. The study hypothesis was the rates of SCA survival to admission, discharge, and discharge with good neurologic status (CPC score 1 or 2) would be higher in HEARTSafe designated communities.

Methods: The HEARTSafe Communities in Connecticut Office of EMS supplied a list of towns that are HeartSAFE designated, and dates of designation. De-identified data from the Cardiac Registry for Prehospital Survival (CARES) were obtained for all SCA from 2013 to 2017 in the 70 Connecticut cities/towns that participate in CARES. For each SCA, it was determined whether the town in which it occurred was HeartSAFE designated at the time of the case. Fisher’s exact tests and t-tests were used to compare groups. Results: Of 2,922 SCA cases, 749 survived to admission, 236 survived to discharge, and 207 had discharge CPC scores of 1 or 2. Of the 2,922 cases, 1,569 (54%) occurred in towns that were HeartSAFE designated at the time of the case. There was a slight difference in survival between towns with more white patients in designated towns, and the mean age was slightly greater in the designated towns (mean 65.4 vs. 63.7 yrs, p = 0.017). There was no significant differences in survival to admis- sion (24.5% vs. 23.2%; p = 0.22), survival to discharge (7.8% vs. 8.5%; p = 0.4), or survival with good neurologic outcome (6.4% vs. 7.7%; p = 0.71). A witnessed status, SCA etiology (cardiac/noncardiac), and SCA location type were similar in the 2 groups. There were no significant differences in survival to admis- sion (24.5% vs. 23.2%; p = 0.22), survival to discharge (7.8% vs. 8.5%; p = 0.4), or survival with good neurologic outcome (6.4% vs. 7.7%; p = 0.71).
the SCA response system likely did not change much. Moving these cases from not described by our findings. Conclusions: SCA survival rates do not differ between HEARTSafe communities and non-HEARTSafe communities in Connecticut.

34. SYSTEM WIDE EVALUATION OF HYPOGLYCEMIA WITH DEXTROSE 10% (D10) VERSUS D50% (D50)

James Tanis, Mark Merlin, Navi Ariyapakrakai, Amundeen Tagore, Janage Holbein, Joslyn Joseph, Alex Torres, Bryant Gray, Dustin St. George, Alex McKeehnie, Nehemia Marra, Christopher Montanaro, Kyle Klein. MONOC EMTS CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Hypoglycemic patients are routinely evaluated and treated by EMS in the prehospital setting. The previous standard of care was an empiric dose of 25 grams of 50% dextrose IV, for blood glucose levels (BGL) less than 60 mg/dL. This practice often results in an iatrogenic hyperglycemic state. Recent studies that establish glucose ranges outside 140 to 180 mg/dL have negatively impacted a patient's morbidity and mortality upon admission to the hospital. The goal of this study is to assess if there is a significant difference in the post-treatment BGL of hypoglycemic patients who receive 10% vs. 50% solutions of dextrose.

Methods: This study is a retrospective chart review of our hypoglycemic patient’s BGL, when given either D10 or D50. Data was collected when the EMS system changed from a D50 protocol to a D10 protocol. D50 was used whenever D50 remained during the crossover period until D50 was no longer available. Two cohorts were created from 1096 consecutive prehospital hypoglycemic cases between October 2015 to June 2018. 197 cases were excluded for missing data, intraosseous (IO) vascular access, glucose per os (orally) (PO), or glucagon intramuscular (IM). Mean blood glucose levels of the 2 cohorts were compared post treatment. The primary outcome is the change in blood glucose level (BGL) between D10 and D50 (n = 792).

Results: There was no confounding between D10 and D50 by age, gender, or race. The difference in initial BGL level median post-treatment significantly varied between cohorts, D10 (66%) and D50 (40%). Additionally, hypoglycemic patients (≥180 mg/dL) post-treatment were more common in the D50 group (59%) compared to D10 (32%) (p < 0.0001). Conclusions: This analysis demonstrates that D10 is just as effective as D50 in treating hypoglycemia and D10 is less likely to overshoot normal blood glucose levels. Our recommendation is to continue with D10 for the treatment of hypoglycemic patients in our EMS system.

35. CONTROLLED FAST HEAD AND THORAX ELECTRICAL STUNTS CARDIOPULMONARY DECOMPRESSION CARDIOPULMONARY RESUSCITATION WITH AN IMPEDANCE THRESHOLD DEVICE IN A PORCINE MODEL OF CARDIAC ARREST

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Background: Cardiac compression-decompression (ACD) CPR with an impedance threshold device (ITD) doubles cerebral blood flow. However, it is unknown whether such a high-CPR (CorPP) in animal models. We recently observed higher CorPP and coronary perfusion pressure (CorPP) during a progressive HUP sequence elevation (20°, 30°, and 40°). However, the optimal speed of elevation is unknown. We hypothesized a faster elevation rate of 4°/min over 4 min would result in a higher CorPP than a slower 2°/min over 10 min.

Methods: Female farm pigs (~40 kg) were intubated and anesthetized. After 8 minutes of untreated ventricular fibrillation (VF) shock, pigs were placed in a HUP CPR device, such that the head and thorax were elevated from 0 to 8 cm above the horizontal plane and able to elevate 22 and 9 cm to the highest position, respectively. Over 2 minutes of automated ACD + ITD CPR, the CorPP was compared during a 2°/min (n = 6) and 4°/min (n = 7) CorPP elevation rate. Pigs were randomized into a 4°/min group and a 2°/min group (n = 6). Pronounced differences were noted at 7 minutes of CPR with a CorPP (mean ± SD, mmHg) of 53.1 ± 14 for the 4°/min group and 30.1 ± 7.5 for the 2°/min group (p = 0.02), and a CorPP of 50 ± 13 35 (p = 0.08), respectively. The differences reached rapidly trended similarly over 19 minutes of CPR suggesting an optimal fast rise sequence. Moreover, in the absence of exogenous vasopressors CerPP and Coronary perfusion pressure (CorPP) values vs. the 2°/min group (n = 6).

Results: There were no statistically significant differences between the 2 groups. In the 4°/min group, the CorPP remained during the crossover period until D50 was no longer available. Two cohorts were created from 1096 consecutive prehospital hypoglycemic cases between October 2015 to June 2018. 197 cases were excluded for missing data, intraosseous (IO) vascular access, glucose per os (orally) (PO), or glucagon intramuscular (IM). Mean blood glucose levels of the 2 cohorts were compared post treatment. The primary outcome is the change in blood glucose level (BGL) between D10 and D50 (n = 792).

36. EFFECT OF ESTIMATED GLOMERULAR FILTRATION RATE (eGFR) ON INCIDENCE OF OUT-OF-HOSPITAL CARDIAC ARRESTS: A CASE-CONTROL STUDY

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Background: Excited delirium and the spectrum of behavioral emergencies represent unique challenges and dangers for EMS providers. These situations include a serious risk of injury to both EMS providers and the patients who require restraint. De-escalation techniques as well as physical and chemical restraints are the mainstays of out of hospital treatment and stabilization of behavioral emergencies. The purpose of this investigation is to describe the options for and inclusion of behavioral emergency protocols and more specifically chemical restraint in state-wide treatment protocols (STP). Methods: Cross sectional study of STPs for inclusion of behavioral health, psychological emergency or excited/agitated delirium protocols. Protocol revision date was also captured.

Results: Thirty-four out of 50 (68%) states issue ALS STPs, 10 of which serve as guide lines; 3 of these states have no protocol for behavioral emergencies or agitated delirium. A single state has a protocol but includes no medications/chemical restraints. Benzodiazepines are the most common chemical restraint, with 28 states (93%) including at least one drug from the Benzodiazepines group. Haloperidol is the most common with 23 states (77%) including it in their protocols. 19 states (63%) allow for IM
Ketamine and IV Ketamine is included in 8 (20%) protocols. Diphenhydramine is included in 3 protocols (10%) and clonidine in 3 states (3%) also include Zyprexa, Geodon and Droperidol. 73% of protocols have been revised since 2015. Conclusions: Behavioral emergencies and agitation diligently addressing present high risk conditions for both EMS and their patients, with high mortality and injury rates. Gaining control of dangerous situations is of paramount importance to provide the safest transport possible. Most, although not all, states provide a protocol for behavioral emergencies, but there is a very large amount of variation among the medications which can be utilized for chemical restraint. This provides an opportunity for standardization as well as examination of best practices. Further study is needed to examine the barriers to introduction and optimization of medication management in behavioral emergency STPs.

36. RESPONSE, AGENCY, AND PATIENT CHARACTERISTICS ASSOCIATED WITH EMS TRANSPORT RATES

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Background: The emergency medical services (EMS) 9-1-1 transport rate has important implications for current reimbursement practices and risks of negative outcomes related to non-transport. A minimal amount of research exists regarding factors linked to EMS transport rates. Objective: Our objective was to identify response, agency and patient characteristics associated with EMS transport rates. Methods: We performed a retrospective analysis using all 9-1-1 responses with patient contact in 2017 in the ESO Solutions electronic health record. Agencies without transport capability were excluded. Independent variables of interest were identified a priori: agency type, agency volunteer status, time of day, day of week, patient sex, patient race/ethnicity, and patient age. Multivariable logistic regression modeling was used to assess for an association between the independent variables and EMS transport. Adjusted odds ratios and 95% confidence intervals are reported (aOR, 95% CI). Results: We analyzed 2,786,615 records; 85% resulted in EMS transport by over 900 agencies. Compared to third service agencies, private agencies demonstrated 30% greater odds of transporting (aOR=1.80, 95%CI:1.78–1.84). Compared to non-volunteer agencies, volunteer agencies demonstrated 31% increased odds of transporting (aOR=1.31, 95%CI:1.26–1.36). Hispanic patients demonstrated 26% decreased odds of transport compared to non-Hispanic White patients (aOR=0.74, 95%CI:0.72–0.76). Compared to patients aged 18–39, patients in older age groups had progressively greater odds of transport with each age group, the largest aOR being 2.62 (95%CI:2.58–2.67) for those over 79. Patients younger than 18 years had lower odds of transport (aOR=0.74, 95%CI:0.73–0.75). Compared to calls occurring between 7 AM and 3 PM, odds of transport were lower between 3 PM and 11 PM (aOR=0.83, 95%CI:0.83–0.85) and between 11 PM and 7 AM (aOR=0.88, 95%CI:0.87–0.88). Similar statistically significant differences in transport rates were seen for sex, day of week, and fire-based agencies. Conclusions: This analysis encompassing a broad range of EMS systems in various practice settings identified differences in transport rates by agency characteristics, time of day, patient race/ethnicity, and age. Further work is needed to elucidate the underlying causes of these differences for each variable. Limitations include the limitations due to documentation practices and potential selection bias from analyzing a single patient care reporting (PCR) provider.

39. DECLINES IN CEREBRAL OXYGENATION PRECEDE DECLINES IN MEAN ARTERIAL PRESSURE IN A HYPOXIC SWINE MODEL

Jeffrey Gould, Christopher Kaufman, Joshua Lamar, Jonathan Elliot, Norman Paradis, ZOLL Medical CATEGORY OF SUBMISSION: CARDIAC

Background: Near-infrared spectroscopy (NIRS) has been used to continuously and non-invasively measure cerebral oxygenation. Studies have suggested that survival and neurological outcomes can be predicted using cerebral oxygenation, however, its utility to predict neurological insult on patient-specific basis is status is less understood. The purpose of this exploratory study was to examine the relationship between cerebral oxygenation and mean aortic blood pressure (MAP) in response to a hypoxic insult in a swine model. Methods: Hypoxia was induced in 14 domestic swine by reducing the fraction of inspired oxygen to ~6%. Cerebral oxygenation was measured using an investigational NIRS-based tissue oximeter (OxiplexTS, ISS) and aortic blood pressure was measured using a solid state pressure transducer placed in the thoracic aorta. The declines in the oxygenation and MAP signals were identified by finding the intersection of the initial slope of the data before the start of the insult and the steepest slope found as a result of the insult. Wilcoxon signed rank tests were used to compare changes in measurements taken before and after the hypoxic insult and the times from the start of the insult to the start of declines for the oxygenation and pressure signals. Data are reported as the median (interquartile range). Results: Cerebral oxygenation declined in response to the hypoxic insult from 60% (55–65%) before the insult to 32% (29–38%); p = 0.005 following the insult. MAP declined from 90 mmHg (77–107 mmHg) to 25 mmHg (20–26 mmHg); p = 0.005. However, the onset of signal decline following the initiation of hypoxia was less for the cerebral oxygenation signal at 28 seconds (25–32 seconds) compared to the decline in the mean aortic pressure signal at 115 seconds (89–138); p = 0.005. Conclusions: Declines in cerebral oxygenation as measured using NIRS precede declines in invasive blood pressure during hypoxia in swine. Monitoring of cerebral oxygenation may be clinically useful in early detection of changes in patient status. Further studies should investigate changes of cerebral oxygenation during other physiological insults and in relation to other measured vital signs.

40. EMS FELLOWSHIP FIELD EXPERIENCE: IDENTIFYING TRENDS IN ONLINE MEDICAL DIRECTION CONSULTATION AND SCENE RESPONSE

Emily Pearce, Chelsea White, Jenna White, Darren Breau, University of New Mexico CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Our goal is to quantify the nature of online medical direction consultations (OLMDC) and scene responses (SR) by emergency medical services (EMS) fellows with assigned take-home emergency response vehicles (ERV) to better understand the potential exposure of fellows to first-year fellowship. Methods: The University of New Mexico’s EMS Consortium has 3 EMS fellows annually who handle complicated OLMDC for the local system and perform both requested and self-initiated SR in assigned take-home ERVs. Fellows take home call for 2 days out of every 6 but may respond to calls at any time. Fellows completed electronic surveys after each OLMDC and SR. A descriptive analysis of 2 years of surveys was completed. Each 12-month period received submission from 3 EMS fellows. Results: 4,383 surveys were collected from 6 EMS fellows over 24 months including 3,129 OLMDC and 1,254 SR for an average of 8.5 OLMDC and 17.4 SR per fellow per month. Patient refusals accounted for 60.4% of OLMDC; the remainder included general advice (16.8%), termination of cardiac arrest (10.1%), and support of patient transport (8.1%). Treatment orders were most often for narcotics (61.2%) and benzodiazepines (16%). A total of 20.0% of SRs were cardiac arrests; the remainder included traffic collisions (12.9%), burns (4.5%), alcohol intoxication (5.1%), penetrating trauma (5.9%), and traumatic injuries (4.8%). Fellows responded with lights and sirens to 153 (12.4%) SR, an average of 1.1 emergency responses/fellow/month. EMS fellows arrived first on-scene 50 times (4.0%). The EMS fellows’ response to SR included: resuscitation (75.2%), patient assessment (44.4%), coaching (21.9%), family discussions (21.5%), termination of resuscitation (7.6%), and hands-on interventions (7.0%). Common hands-on interventions included ultrasonography (50.0%), obtaining vital signs (17.0%), medication administration (14.8%), and basic life support (BLS) airway management (10.2%). Conclusions: Field response is an important component of EMS fellow education. EMS fellows with access to a ERV within an EMS system that utilizes fellows for OLMDC can obtain a tremendous amount of experience within a 1-year program. Fellowship education should also include specific training related to safe emergency vehicle operations and protocols for arriving first on scene.

41. PREHOSPITAL OPIOID ADMINISTRATION TO ACUTE MYOCARDIAL INFARCTION PATIENTS: A SYSTEMATIC REVIEW

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Background: Opioids are routinely administered for analgesia to prehospital patients experiencing chest discomfort from acute myocardial infarction (AMI). We conducted a systematic review to determine if opioid administration impacts patient outcomes. Methods: We conducted a systematic search using MeSH terms and keywords in Medline, Embase, Cochrane Database of Systematic Reviews, Cochrane Central, and Clinicaltrials.gov for relevant randomized controlled trials and observational studies comparing opioid administration in AMI patients from 1960 to 2019. The outcomes of interest were: all-cause short-term mortality (<30 days), major adverse cardiac events (MACE), platelet activity and aggregation,
immediate adverse events, infant size, and analgesia. Included studies were hand searched for additional citations. Risk of bias assessments were performed and GRADE methodology was employed to assess quality and overall confidence in the effect estimate.

Results: 3,001 citations of which 19 studies were reviewed as full texts and a total of 9 studies were included in the analysis. The studies predominantly reported on morphine as the opioid. Five studies reported on mortality (<30 days), 7 on MACE, 4 on platelet activity and aggregation, 2 on immediate adverse events, 2 on infant size, and none on analgesic effect. We found low quality evidence suggesting no benefit or harm in terms of mortality or MACE. However, low quality evidence indicates heart rate in response to alarm activation. Five studies reported on heart rate in response to alarm activation. We found no clear benefit or harm on patient-oriented clinical outcomes including mortality.

42. HEART RATE RESPONSES OF EMS WORKERS DURING DAY AND NIGHT SHIFTS

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Background: Previous studies of firefighters have reported a rapid and sustained rise in heart rate during additional calls during the shift. Studies of EMS workers during shifts have reported similar findings. We hypothesized that heart rate response to alarms would be similar to previous studies of firefighters and that ventricular ectopy would be more frequent during the night shift. A total of 8 EMS workers (4 females) participated in the study. Subjects wore a 12-lead Holter monitor (Mortara) and activity monitor (Actigraph) during a single day (DAY) or overnight (NIGHT) shift. The agency identified alarm activations for each worker during the monitored shift. ECG files were analyzed and heart rate measures during the shift, immediately before and after, and during each call. Groups were compared by t-test. Results: Providers in both groups were similar in age (27 ± 4 vs. 32 ± 5) and height (176 ± 9 cm) but the DAY group had a higher BMI (33.0 ± 6.9 vs. 23.2 ± 3.5). Minimum (61 ± 34, 9) mean (88 ± 15), and maximum (143 ± 19) heart rate during the shift did not differ by group. Each provider responded to 1–8 calls during their monitored shift. The average heart rate in the 3 minutes prior to the alarm was 90 ± 18 bpm and rose to 111 ± 18 bpm following the alarm. The highest heart rate measured during the call (129 ± 19) bpm often did not occur immediately following the alarm but later in the call. Ten subjects (71%) experienced premature ventricular contractions during the shift and 4 subjects (2DAY, 2NIGHT) experienced greater than 20 in a shift. Overall metabolic rates were low (1.7 ± 0.3 L/min) and total kilocalories expended during the shift were correlated with call volume (p = 0.006). Conclusions: Heart rate response to alarms were similar in this group of EMS workers when compared to previous studies of firefighters but the maximal heart rate during the call was lower. Average energy expenditure during the shift approached values for sedentary activities.

43. DO MENTAL HEALTH CONCERNS CONTRIBUTE TO PARAMEDICS LEAVING THE PROFESSION?

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Background: While there is growing research focusing on mental health in the paramedic community, a minimal amount remains known regarding the influence of depression, anxiety and stress on the decision to leave the profession. The purpose of this study was to determine the prevalence of anxiety, depression, and stress, and paramedics self-reported mental health as determinants of their intent to leave the profession. Our hypothesis was that the decision to leave the paramedic profession would be influenced by poor mental health. Methods: Through the national Canadian Paramedic Health & Wellness survey, paramedics were asked to indicate if they intended to leave the profession in the next 2 years, their reason(s) for leaving, as well as the number of days of work missed for mental health reasons in the past 12 months. Levels of depression, anxiety, and stress were measured using the DASS-21. Analyses were conducted using descriptive statistics and independent samples t-tests. Results: Based on 2,557 completed surveys, 18.5% (n = 473) reported they intended to leave the profession within the next 2 years, with lack of opportunities for advancement cited the primary reason (52%). A total of 11% reported that being mentally unable to continue significantly influenced their decision to leave. With respect to the number of days of work missed for mental health reasons, significant differences were noted between those who did (M = 11.82, SD = 47.80) vs. did not intend to leave (M = 2.92, SD = 18.02). t(487.71) = −3.95, p < 0.001. Scores on the DASS-21 revealed that 27.9% of the respondents had mild to severe levels of depression, 22.5% had mild to severe levels of stress, and 21.1% had mild to severe levels of anxiety. Furthermore, for those who intended to leave vs. those who did not, levels of depression were significantly higher, t(604.59) = −8.324, p < 0.001, anxiety t(584.11) = −6.13, p < 0.001, and stress t(614.89) = −8.14, p < 0.001. Conclusions: While mental health was not the most frequently cited reason to leave the paramedic profession, underlying levels depression, stress, and anxiety may indirectly be contributing factors. Scores on the DASS-21 may be a good proxy for determining exit patterns from the profession.

44. COMPLETION OF AN ALTERNATIVE PATHWAY TO PARAMEDIC CERTIFICATION BY NON-EMS PROFESSIONALS IS ASSOCIATED WITH HIGH PASS RATES ON THE NATIONAL PARAMEDIC CERTIFICATION EXAMINATION

William Leggio, Ashish Panchal, Michael Miller, Creighton University

Background: Hospital-based healthcare professionals often transition their skills into the prehospital setting. However, one challenge for these care providers is the knowledge gap between the 2 practice settings. Paramedic programs have developed alternative pathway paramedic curricula to bridge this gap but there is a need for data concerning whether these students attain minimal competency as a paramedic. The objective of this study was to evaluate course completion rates and first and cumulative third-attempt pass rates of students completing an alternative pathway to paramedic certification at Creighton University. We hypothesize that non-emergency medical services (EMS) healthcare professionals who completed this pathway were able to attain minimal competency as a paramedic as assessed by the National Paramedic Certification examination. Methods: The alternative pathway paramedic course at Creighton University is a 2-week intensive experience including didactic and psychomotor sessions, completion of 50 paramedic team-lead patient encounters, and passing the program’s comprehensive final examination (score >80%). Applicants were required to provide a certified registered nurse or higher training levels and had at least 2 years of acute care experience. Program demographic and performance data were collected from 2007 to 2017 along with individual performance data on the National Paramedic Certification examination (first and cumulative third-attempt pass rates). Descriptive statistics were used. Results: Over the study period, 305 students attended the course with 271 (89%) completing the program. Of these, 201 (74%) sat for the National Paramedic Certification examination. Students were mainly female (52%) and median age was 34 years old (IQR 29–42). The majority of students were registered nurses (n = 291, 95%) with >70% (n = 214) having at least a bachelor’s degree. The first-attempt pass rate for graduates was 97% (195/201) with a cumulative pass rate after 3 attempts being 98% (190/193). One student did not retake following their first unsuccessful attempt. Conclusions: Non-EMS healthcare professionals completing the alternative pathway to paramedic certification course had high rates of course completion as well as passing the National Paramedic Certification examination. This study is limited by being a single site evaluation and may present a high-performing curriculum. Future work will need to evaluate other alternative pathway programs and identify best practices for success.

45. PEDIATRIC VITAL SIGNS AND GLASSGOW COMA SCALE SCORE CALCULATION IN THE PREHOSPITAL SETTING: A LOSING BATTLE?

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Background: Transport destination decisions for injured children rely upon accurate triage, especially for the application of the physiologic criteria of the CDC Field Triage Guidelines. We aimed to identify the rates at which vital signs and Glasgow Coma Scale scores (GCS) are documented by emergency medical services (EMS) providers, and the
between the 2 sources was reported using kappa statistics and concordance correlation coefficients (CCC) between the intervals (CCC). Results: Of the 200 encounters that met inclusion criteria, 72% had matching chief complaints between the TOC and PCR. Median Glasgow Coma Score (GCS) and allergy were matched in 82%. Up to 3 BP, pulse, and RR were collected; only 30% of the third BP were available from the TOC, while 68% of the second BP were available. Comparing the first 3 SBP values on the TOC to respective counterparts on the PCR showed substantial correlation (all CCC >0.95). DBP values showed poor-to-moderate correlation (CCC: 0.767, 0.921, and 0.937, respectively). Pulse had moderate-to-substantial correlation (CCC: 0.925, 0.945, and 0.960, respectively). RR had poor-to-moderate correlation (CCC: 0.650, 0.840, and 0.938, respectively). GCS showed poor correlation between the 2 forms (CCC: 0.811). Conclusions: There were significant differences between the information transferred to the ED through the TOC compared to what was recorded in the PCR. Further evaluation of the transfer of care process is needed to improve accuracy.

47. ASSOCIATION BETWEEN QUANTITATIVE WAVEFORM MEASURES OF THE VENTRICULAR FIBRILLATION ELECTROCARDIOGRAM AND DEFIBRILLATION SUCCESS IN THE ROC ALPS TRIAL

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Background: During out-of-hospital cardiac arrest (OHCA), features of the ventricular fibrillation electrocardiogram (EGC) have been correlated with outcomes. Understanding factors affecting the variability of these features may elucidate their utility. We examined the association between quantitative waveform measures (QWM) of the VF ECG and defibrillation success in the context of the Resuscitation Outcomes Consortium (ROC) amiodarone, lidocaine, and placebo (ALPS) trial. Methods: We retrospectively obtained case data for patients enrolled in the ALPS trial from the ROC data coordinating center (DCC). The primary trial end point was a composite of a patient’s prehospital care team (EMTs) treated OHCA initiated with at least one failed defibrillation from 2012 to 2015 at 10 sites across the ROC network for randomization to amiodarone, lidocaine, or placebo. We included all enrolled cases with an ECG file available through the DCC. ECG signals were analyzed with custom, semi-automatic software to identify shocks, parse pre-shock ECG segments, and identify pre- and post-defibrillation rhythms, including post-shock return of organized rhythm (ROOR). Three QWM – AMSA, centroid frequency (CF), and median slope (MS) – were calculated for pre-shock ECG segments. Multivariable logistic regression models accounting for repeated shocks were constructed with outcome ROOR, adjusting for ALPS entry EMTs’ treatment arm, shock number, and relevant case characteristics. Results: A total of 1,242 cases were available for analysis, comprising a total of 5,480 defibrillation events with identifiable pre-shock VF. Mean (SD) QWM values for all shocks were: AMSA: A6.74 (10.80), CF:3.98 (1.68), MS:0.02 (0.02), CF, but not AMSA, MS, were both associated with ALPS treatment arm when controlling for shock number (pamio <0.001; plido = 0.016). All QWM were significantly directly associated with defibrillation success in multivariable models (ORAMA =1.03 [95% CI: 1.02–1.04], ORCF = 1.35 [95% CI: 1.26–1.45], ORM5 = 1.05 [95% CI: 1.04–1.06]).

Conclusions: In the ROC ALPS trial, QWM were associated with defibrillation success independent of shock number or treatment arm.
Background: Tranexamic acid (TXA) is an antifibrinolytic used for decades to treat dermal and vaginal bleeding. Recent evidence (CRASH-2 and MATTIE) demonstrated mortality benefit when used within 3 hours of traumatic injury with suspected hemorrhagic shock. Given the time-dependent benefit of TXA which may be maximized by early administration in the field, TXA has entered the EMS pharmacopoeia despite a paucity of research in this environment. The purpose of this investigation is to describe the extent to which TXA has been incorporated into statewide treatment protocols (STPs), and characterize the indications for its use. Methods: Cross sectional study of STPs utilizing a standardized review for inclusion of TXA in Paramedic level protocols, as well characteristics of the protocols. Protocol revision date was also captured.

Results: Thirty-three out of 50 states issue Paramedic STPs or guidelines. TXA is included in 11 (34%) of these as an approved medication, but with specific protocols in only 10 states. Three special cases exist, Massachusetts, which includes TXA as a medication with an explicit STP, protocol wide protocol, North Carolina, which offers TXA as a medical director option but does not have a statewide protocol for TXA, and Ohio, which includes a specific TXA protocol for cardiac arrest care, but does not have a protocol for routine trauma care. Of states with TXA protocols, 8 (26%) offered specific guidelines for administration during systolic blood pressure <90 mmHg or heart rate ≥110 bpm thresholds. Time ≥3 hours from injury was a contraindication for use of TXA in 9 (28%) of states. Pediatric TXA was included in 2 (20%), and provision for repeat or infusion dosing was included in 2 (20%) of protocols. Conclusions: While the benefit of TXA in the prehospital setting has yet to be proven, TXA use in trauma care in TXA in their pharmacopoeia. The majority of protocols mirror the criteria used in the CRASH-2 study with others provide non- official guidance on its use. Further study is needed to examine the efficacy and safety of prehospital TXA administration by paramedics as well as determination of optimal criteria for administration in STPs.

50. CHARACTERISTICS OF NATIONALLY-CERTIFIED PREHOSPITAL PATIENT CARE PROVIDERS IN THE UNITED STATES

Madison Rivard, Rebecca Cash, Ashish Fanchal, National Registry of Emergency Medical Technicians CATEGORIES OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Emergency medical services (EMS) professionals function as a key part of the healthcare continuum. However, there is a paucity of current information that describes the national EMS workforce who provides patient care and the roles and settings in which they work. The objective of this study was to describe the workforce characteristics of nationally-certified EMS professionals who provide patient care in the U.S.

Methods: We completed a cross-sectional analysis of EMS professionals who recertified their National EMS Certification between January 1, 2017 and December 31, 2018. During the recertification process, EMS professionals completed an optional 10-question workforce profile collected for administrative purposes only. This study was exempt by our institutional review board. We included EMS professionals who were between ages 18 and 85, currently working as a patient care provider, and certified as an emergency medical technician (EMT) or higher. Descriptive statistics were calculated. Ninety-eight percent of these professionals, 87,471 EMS professionals (response rate = 82%) completed the profile, with 66,063 patient care providers included in our analysis. Most of the patient care were male (74%), non-Hispanic white (84%) and were a median age (IQR) of 35 years (28–44). Over half (54%) were certified as an EMT, 5% as advanced EMTs, and 41% as paramedics. Most patient care providers (75%) worked full-time at their main EMS agency. Nearly half (45%) of patient care providers worked in rural communities, while 21% worked for private agencies. A total of 69% of patient care providers primarily provided 9-1-1 service, with 13% providing both 9-1-1 and medical transport. More patient care providers worked in urban communities with ≥25,000 people (64%) than in rural communities (36%). Conclusions: In this sample of nationally-certified EMS patient care providers, the majority worked full-time, at fire or private agencies, and provided 9-1-1 service while working in urban settings. This analysis provides a snapshot of the characteristics of patient care providers in the prehospital setting. Limitations include the potential exclusion of EMS professionals who hold a primary role of supervisors or preceptors yet provide care, but do not have a protocol for routine trauma care. Of states with TXA protocols, 8 (26%) offered specific guidelines for administration during systolic blood pressure <90 mmHg or heart rate ≥110 bpm thresholds. Time ≥3 hours from injury was a contraindication for use of TXA in 9 (28%) of states. Pediatric TXA was included in 2 (20%), and provision for repeat or infusion dosing was included in 2 (20%) of protocols. Conclusions: While the benefit of TXA in the prehospital setting has yet to be proven, TXA use in trauma care in TXA in their pharmacopoeia. The majority of protocols mirror the criteria used in the CRASH-2 study with others provide non-official guidance on its use. Further study is needed to examine the efficacy and safety of prehospital TXA administration by paramedics as well as determination of optimal criteria for administration in STPs.

51. COMPARISON OF SURVIVAL OUTCOMES AND FACTORS ASSOCIATED WITH OUT-OF-HOSPITAL CARDIAC ARREST FROM PRESUMED OVERDOSE ETIOLOGY IN PENNSYLVANIA

Mark Lehman, Douglas Kupas, Anne Knorr, Andrea Berger, Division of EMS, Geisinger Health System SOM獵獵獵獵獵獵獵獵獵獵獵

Background: The opioid epidemic is a national crisis. We sought to compare survival and characteristics among etiologies of out-of-hospital cardiac arrest (OHCA), including overdose. We hypothesized that OHCA from drug overdose would be less likely to be witnessed or have a shockable rhythm and therefore less likely to survive. Methods: The Cardiac Arrest Registry to Enhance Survival was queried to identify OHCA cases that had resuscitation attempted by emergency medical services from 2013 to 2017 in Pennsylvania. Return of Spontaneous Circulation (ROSC), overall survival, and survival with good neurological outcome (cerebral perfusion score of 1 or 2) were compared among three OHCA etiology groups: presumed overdose (OHCA-OD), presumed cardiac etiology (OHCA-cardiac), and all other (OHCA-others). Results: A total of 25,784 OHCA cases were identified. OHCA-OD was associated with a lower rate of ROSC (32.7%) compared to OHCA-cardiac (61.6%; OR = 1.6, 95%CI: 1.2–2.0) and compared to OHCA-others (9.6%; OR = 1.4, 95%CI: 1.0–1.8). Among the survivors, OHCA-OD had an increased chance of favorable neurologic outcome (93.9%) compared to OHCA-cardiac (81.1%; OR = 2.7, 95%CI: 1.3–5.2) and OHCA-others (65.5% 95%CI: 2.6–14.3). Conclusions: The proportion of OHCA from overdose in Pennsylvania is rising. These patients are more likely to survive and have favorable neurologic recovery among survivors, when compared to presumed cardiac and all other etiologies. This may be a result of younger age, better overall health, or misdiagnosis of respiratory depression as cardiac arrest in overdose patients.

52. PARAMEDIC ACCURACY IN NEEDLE THORACOSTOMY SITE SELECTION

Joshua Knapp, Maude Kettenmann, Jeffrey Lubin, Department of Emergency Medicine, Pennsylvania State Hershey Medical Center SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Tension pneumothorax is an immediate threat to life. Treatment in the prehospital setting is commonly achieved by needle thoracostomy (NT). Current teaching is to perform NT in the second intercostal space at the mid-clavicular line (2nd ICS) MCL). Previous literature has suggested that Emergency Physicians have difficulty with identifying the correct anatomic location for NT. We hypothesized that civilian paramedics would also have difficulty in accurate identification of the location for NT. Methods: A prospective, observational study was performed to assess paramedic ability to identify the location for treatment for NT. Participants were recruited during a statewide EMS conference. Subjects were asked the anatomic site for NT and asked to mark the site on a shirtless male volunteer. The site was copied onto a transparent sheet lined up against pre-existing points on the volunteer's chest. Participants were then compared against the correct location that had been identified using palpation, measuring tape, and ultrasound. Results: Twenty-nine paramedics participated, with 24 (83%) in practice for more than 5 years and 23 (79%) doing mostly or all 9-1-1 response. All subjects (100%) reported training in NT, 6 (21%) had never performed NT in the field. Nine paramedics (31%) recognized the 2nd ICS in the MCL as the desired site for NT, with 12 (41%) specifying only the 2nd ICS, 11 (38%) specifying 2nd or 3rd ICS, and 6 (21%) naming a different location (3rd, 4th, or 5th ICS). None (0%) of the 29 paramedics identified the exact 2nd ICS MCL on the volunteer. Mean distance from the 2nd ICS MCL was 1.37 cm (IQR: 0.7–1.90) in the medial-lateral direction and 2.43 cm in the super-inferior direction (IQR: 1.10–3.70). Overall mean distance was 3.12 cm with a 2 cm radius from the correct position, 8 (28%) approximated the correct placement. Twenty-five (86%) were within a 5 cm radius from the correct location. Conclusions: In this study, paramedics had difficulty identifying the correct anatomic site for needle thoracostomy. EMS Medical Directors may need to rethink training or consider alternative techniques.
53. Place-Provider-Matrix of Bystander and Outcomes of Out-of-Hospital Cardiac Arrest: A Nationwide Observational Cross-Sectional Analysis

Dae Kon Kim, Sang Do Shin, Young Sun Ro, Kyoun Jun Song, Ki Jeong Hong, Joo Jeong, Seoul National University Hospital, Department of Emergency Medicine Category of Submission: Cardiac

Background: The concept consisting of place-provider-matrix (PPM) for cardiopulmonary resuscitation (CPR) program is the combining method between place factor and provider factor. We hypothesized that different PPM groups would have different effect size on the time interval to initiation of CPR and defibrillation and eventually survival and neurologic outcome. This study aims to test the association between place-provider-matrix (PPM) of bystander CPR and outcomes in out-of-hospital cardiac arrest (OHCA). Methods: Adults OHCA with cardiac etiology from 2012 to 2016 in Korea were analyzed, excluding cases with unknown etiology, unknown type of bystander, and unknown outcomes. The PPM was categorized by place (public versus home) and provider (first responder, family, layperson, or citizen volunteers). Public-Trained, Public-Layperson, Home-Trained, Home-Family, and Home-Layperson. Outcomes were survival to discharge and good cerebral performance category (CPC) 1 or 2. Multivariable logistic regression analysis was performed to test the association between PPM and outcomes, adjusting for potential confounders to calculate adjusted odds ratios (AORs) and 95% confidence intervals (CIs). Results: Total 58,493 patients were analyzed; Public-Trained (372, 0.6%), Home-Trained (N = 197, 0.3%), Public-Family (N = 1113, 1.9%), Home-Family (N = 47220, 80.9%), Public-Layperson (N = 5243, 9.0%), and Home-Layperson (N = 4248, 7.3%). AORs (95% CIs) for survival to discharge by Home-Trained, Public-Trained, Public-Family, Home-Family, Public-Layperson, and Home-Layperson were 0.63 (0.33-1.19), 0.88 (0.62-1.25), 0.42 (0.31-0.57), 1.25 (0.92-1.70), and 0.66 (0.51-0.85). AORs (95% CIs) for good CPC by Home-Trained, Public-Trained, Home-Family, Public-Layperson, and Home-Layperson were 0.76 (0.55-1.07), 1.03 (0.76-1.39), 0.75 (0.51-1.10), 1.18 (0.94-2.02), and 0.43 (0.29-0.66), respectively. Conclusion: Place-Provider-Matrix can help focus on which group has lower CPR efficiency and categorize OHCA population by performance category (CPC) 1 or 2. Multivariable logistic regression analysis was performed to determine the effect of the intervention, and adjusted odds ratios (AORs) with 95% confidence intervals were calculated, adjusting for potential confounders. Results: A total of 2,587 eligible OHCA cases (1,241 controls before, and 1,346 cases after the intervention) were evaluated. The bystander CPR ratio in the before and after intervention periods (54.4% in before and 59.6% in after periods; p-value <0.01). However, the goodness in bystander defibrillation in before-and-after intervention (0.9% vs. 0.6%; p = 0.3848). The outcomes during the before-and-after intervention periods were 43% and 7.4% for good neurologic outcome (p < 0.0001) and 5.8% and 11.7% for survival to discharge (p < 0.0001). The AORs (95% CIs) for good CPC and survival to discharge during the before-and-after intervention periods were 3.47 (1.96-6.14) and 2.27 (1.53-3.39), respectively. Conclusion: The TM alert system for OHCA was associated with better outcomes through an increase in bystander CPR but not in bystander defibrillation (Clinical trials registration; NCT010210151).

54. Emergency Medication Shortages: Strategies to Maintain Continuous Medication Availability for Emergency Medical Services


Background: Emergency medication shortages are an ongoing concern and may adversely affect prehospital care. Mitigation strategies have been proposed, but there are few data quantifying which strategies have been utilized by EMS providers. We sought to examine the extent of such shortages and to determine which strategies (if any) are similar or different between provider agencies. Methods: A 10-question survey was electronically distributed to 30 public advanced life support (ALS) provider agencies (over 600,000 annual 9-1-1 calls) to assess provider agency characteristics, prevalence of medication shortages, types of shortage mitigation strategies and interest in use of alternative analgesics to opioids. Descriptive statistics were calculated, including frequencies and proportions. Results: A total of 29 of 30 provider agencies (97%) between May 14, 2018 and July 6, 2018. The majority (97%) of responding agencies were impacted by medication shortages.Agencies employed various substitution supplies: 71% used alternative vendors, 54% rotated medications from low to high volume units, 50% utilized FDA expired medication extensions, 43% substituted non-opioid analgesics depending on availability, 32% borrowed medications from other agencies, 29% utilized expired medications with medical director approval, 18% diluted medications to obtain desired concentration, 14% reduced minimum periodic automatic replacement (PAR) levels, and 14% used alternative medications or formulations.Epinephrine (0.1 mg/mL) was the most frequently reported medication shortage (67% of agencies) followed by morphine (52%), dextrose 10% (41%), normal saline (35%), epinephrine (1 mg/mL) (26%), atropine (15%), sodium bicarbonate (11%), other medications (11%), and fentanyl (7%). None of the provider agencies self-reported adverse events due to the shortages. When queried about interest in expanding paramedic scope of practice to include administration of non-opioid analgesics, 59% of agencies supported the addition of ketamine, 55% supported ketorolac, 21% supported intravenous acetylsalicylic acid, and 25% did not support expanding scope. Conclusion: Medication shortage strategies impacted an overwhelming majority of ALS provider agencies in this regional urban-suburban EMS system. Provider agencies implemented a broad range of mitigation strategies and no adverse events were reported. A majority of agencies demonstrated interest in expanding paramedic scope of practice to include use of non-opioid analgesics as an additional mitigation strategy.

55. Association Between a Text Message Alert System for Trained Volunteers and Resuscitation Outcomes in a Porcine Cardiac Arrest with Prolonged Resuscitation Duration

Tae Han Kim, Sang Do Shin, Kyoun Jun Song, Ki Jeong Hong, Young Sun Ro, Jeong Chan Lee, Yoon Ha Joo, Department of Emergency Medicine, National University Boramae Medical Center Category of Submission: Cardiac

Background: Clinical studies on out-of-hospital cardiac arrest (OHCA) have reported the Supraglottic airway device (SGA) was associated with poor outcomes than endotracheal intubation (ETI) in cardiopulmonary resuscitation (CPR), which was explained by a selection bias or dislocation of tube. We hypothesized the SGA can compromise the blood flow in the neck vessels due to compressing the carotid sheath to the neck vessels. The study aimed to compare the carotid blood flow over time in prolonged resuscitation duration in cardiac arrest porcine model providing between SGA and ETI. Methods: This is a case-cross over experimental study using 12 porcine CPR models with 40-50kg weight. ETI and 3 different SGAs (Combitube, Laryngeal Mask Airway) were inserted alternatively after induction of cardiac arrest according to randomized sequences. Chest compression was provided systems have been tried to give information of OHCA event location or nearest public access defibrillator (PAD) to pre-registered lay persons or citizen volunteers. This study aimed to investigate the effect of a text message (TM) alert system implemented in a metropolis on the outcome of out-of-hospital cardiac arrest (OHCA). Methods: A population intervention study was conducted for resuscitation-attempted OHCA from 2013–2014 (before) and from 2015–2016 (after) in selected districts of a metropolis with population of about 2 million. The intervention consisted of text messages (TM) that were sent by a dispatch center to registered volunteers to inform them of the OHCA event, location of victim, and nearest available automatic external defibrillator. The bystander CPR ratio between the before and after intervention periods (54.4% in before and 59.6% in after periods; p-value <0.01). However, the goodness in bystander defibrillation in before-and-after intervention (0.9% vs. 0.6%; p = 0.3848). The outcomes during the before-and-after intervention periods were 43% and 7.4% for good neurologic outcome (p < 0.0001) and 5.8% and 11.7% for survival to discharge (p < 0.0001). The AORs (95% CIs) for good CPC and survival to discharge during the before-and-after intervention periods were 3.47 (1.96–6.14) and 2.27 (1.53–3.39), respectively. Conclusion: The TM alert service for OHCA was associated with better outcomes through an increase in bystander CPR but not in bystander defibrillation (Clinical trials registration; NCT010100151).
using the same mechanical device. Carotid blood flow (CBF) was repetitively measured and compared across periods of ETI insertion and preceding ETI. Trends of CBF and mean arterial pressure (MAP) according to type of airway device transition (ETI to SGA or SGA to ETI transition) during the course of prolonged resuscitation were calculated and plotted. Results: Physiologic parameters of 12 pigs during CPR were measured. Reduction of CBF was significant after inserting I-gel and Combitube compared to ETI (mean difference (95%CI): –685 mL (–1052–318) for Combitube, –369 mL (–691–5–226) for I-gel). MAP decreased subsequently after transitioning airway devices regardless of device type as resuscitation was prolonged (mean MAP change (95%CI) in ETI to SGA transition: –3.6 mmHg (95%CI –5.6–1.6)). However, reduction of CBF was relatively spared when transitioning of airway devices was from SGA to ETI (mean CBF change (95%CI) in ETI to SGA transition: –480 mL (–1675–286), SGA to ETI transition: –4 mL (95%CI –182–175)). Conclusions: SGA insertion was highly decreased CBF during CPR in porcine experimental model. As resuscitation is prolonged, CBF reduction is aggravated after SGA insertion compared to reduction after endotracheal intubation.

57. ASSESSING SLEEP QUALITY, DAYTIME SLEEPINESS, AND HEALTH-RELATED QUALITY OF LIFE AMONG EMS PROVIDERS BEFORE AND AFTER A CHANGE IN THEIR SHIFT LENGTH AND END TIME

Patricia Dowbiggin, Allison Infinger, Jonathan Studnek, Mecklenburg EMS Agency Category of Submission: Operations, Quality, Safety Systems

Background: Our objective was to determine if changes in primary shift length and end time among EMS providers affect perceived sleep quality, daytime sleepiness, and health-related quality of life. The study was done on a cohort of EMS providers using the study period and self-selected new shift assignments on January 2018. After the new shift assignments participants were evaluated for shift change exposure. Data was collected on their shift lengths by >2 hours, or changed end time by >2 hours. Furthermore, all participants experienced a change in weekly workload from 42-hours to a 40-hour shift. Prior to shift change, an initial survey was deployed to assess sleep quality (Pittsburg Sleep Quality Index, 0–21 best to worst), daytime sleepiness (Epworth Sleepiness, 0–24 best to worst), and health-related quality of life (CDC’s Health Related Quality of Life, 1–5 best to worst) prior to shift change. Other variables collected included demographics and total number of years employed. Participants completed follow-up surveys one and 3 months after shift change. Paired t-tests were used to assess differences. Results: A total of 30 eligible participants completed 4 survey cycles, with 32 (64%) exposed to shift change. The cohort was 28% female, 52% married, with a mean age of 34 years and 7.2 years of employment. The increased work week poor sleep quality (6.6, 95% CI: 5.66–7.54), minimal daytime sleepiness (7.76, 95% CI: 6.74–8.78), and “good” self-reported health (2.6, 95% CI: 2.39–2.85) were no significant differences in sleepiness (7.82, 95% CI: 6.70–8.94), sleep quality (6.9, 95% CI: 5.71–8.09), or quality of life (2.6, 95% CI: 2.34–2.96) before or after exposure. There were no significant differences when assessing the change to a 40-hour week and a 40-hour shift change to SGA to ETI transition. Reduction of CBF was significant after inserting I-gel and Combitube compared to ETI (mean difference (95%CI): –685 mL (–1052–318) for Combitube, –369 mL (–691–5–226) for I-gel). MAP decreased subsequently after transitioning airway devices regardless of device type as resuscitation was prolonged (mean MAP change (95%CI) in ETI to SGA transition: –3.6 mmHg (95%CI –5.6–1.6)). However, reduction of CBF was relatively spared when transitioning of airway devices was from SGA to ETI (mean CBF change (95%CI) in ETI to SGA transition: –480 mL (–1675–286), SGA to ETI transition: –4 mL (95%CI –182–175)). Conclusions: SGA insertion was highly decreased CBF during CPR in porcine experimental model. As resuscitation is prolonged, CBF reduction is aggravated after SGA insertion compared to reduction after endotracheal intubation.

58. BARRIERS AND ENABLERS TO VOLUNTEER EMS PROVIDER RECRUITMENT AND RETENTION

Cecily Swinburne, Tania Stratton, Matthew Sholl, Albany Medical Center Category of Submission: Student, Resident, Fellow

Background: Volunteers play a vital role in staffing ambulances, especially in rural areas. Of the 751 licensed Emergency Medical Service (EMS) agencies in Maine, New Hampshire, and Vermont, 482 (65%) rely at least partially on volunteer providers. Many ambulance services face difficulty recruiting and retaining volunteers. Objectives: This study characterized volunteer ambulance services in northern New England, evaluated their ability to respond to emergency medical calls, and identified barriers and enablers to recruitment and retention of EMS volunteers. Methods: In the first phase of this 2-part, mixed-METHODS study, a 27 question, online survey was emailed to representatives of all agencies in Maine, New Hampshire, and Vermont that report utilizing volunteer providers. The survey focused on agency structure, benefits offered to providers, and their ability to meet staffing needs. In phase 2 of the study, a subset of survey respondents were contacted by phone to further investigate their experiences. Results: In phase one, there were 201 responses for a response rate of 46%. Only 21% of respondents reported being adequately staffed and 33% reported missing calls at least monthly due to staffing. In phase 2, 22 interviews were conducted from which we could identify the five themes. Interviewees reported that the most common reasons providers join volunteer EMS is to help their communities and to gain experience. They also mentioned the time demands of training, Workday calls are hardest to cover and agencies often rely on just a few members to cover most calls. New volunteer are most successfully recruited through EMT/EMR classes, but many agencies have had to hire staff to help provide coverage. Overtime, agencies have seen a trend towards fewer volunteers and more calls. Conclusions: The current EMS system in northern New England is struggling to meet the demands of the communities. The increasing prehospital scope of practice and resulting increase in educational requirements is creating time demands that surpass the abilities of most volunteers. As a result, many departments are currently in transition from staffing entirely with volunteers to relying more heavily on paid providers to cover calls.

59. PREHOSPITAL FEASIBILITY AND ACCURACY OF INTRAVENTRICULAR BOLUS DOSE NITROGLYCERIN IN SYMPATHETIC CRASHING ACUTE PULMONARY EDEMA PATIENTS

Casey Patrick, Brad Ward, Jordan Anderson, Kevin Crocker, Robert Dickson, Amy Emmett, Casey Sholl, Cecily Swinburne, Tania Strout, Matthew Sholl

Background: The necessity of both preload and afterload reduction in patients with sympathetically crashed acute pulmonary edema (SCAPE) is well established. In the prehospital setting, this has typically been accomplished via nitroglycerin, given either topically or sublingually. SCAPE patients are often critically ill and receiving non-invasive positive pressure ventilation which makes topical and sublingual drug administration suboptimal. The purpose of this study is to assess the safety and accuracy of prehospital intravenous bolus nitroglycerin in SCAPE patients treated by a single, high-volume, ground based EMS agency. Methods: This is a prospective, observational study. Inclusion criteria for treatment with IV bolus nitroglycerin included both hypertension, defined as systolic blood pressure (SBP) ≥ 160 mmHg, and acute respiratory distress in the setting of precardiac dysrhythmia or presupposition of SCAPE. An initial dose of 1mg intravenous nitroglycerin was administered slowly and repeated in 5 minutes if SBP remained greater than 160 mmHg. We defined episodes included both EMS and receiving hospital electronic medical records. Results: Ten patients have been treated thus far with an average nitroglycerin dose of 0.52mg. Average initial EMS SBP 206 +/- 20 with an average initial emergency department (ED) SBP of 178 +/- 24. No significant episodes of hypotension occurred, either en route, or upon arrival to the ED (lowest ED arrival SBP p = 142). 100% of the patients treated have had ED chest X-Ray findings consistent with pulmonary edema, confirmed by LV overload, and/or pleural effusion. Average ED BN p = 1747 +/- 1222. None of the patients were intubated by EMS during transport and only 20 out of 10 were intubated within 6 hours of hospital arrival. Additionally, 3 out of 10 patients were admitted to the ICU. There were no reported adverse events during transport. Conclusions: This preliminary data suggests that prehospital administration of bolus dose IV nitroglycerin in SCAPE patients may be safe and effective. Further studies are needed to determine if the use of prehospital intravenous bolus nitroglycerin is beneficial to patient morbidity and mortality.

60. INTER-RATER RELIABILITY OF THE FAST-ED IN THE OUT-OF-HOSPITAL SETTING

Jonathan Studnek, Allison Infinger, Patricia Dowbiggin, Mecklenburg EMS Agency Category of Submission: Medical

Background: Patients experiencing a large vessel occlusion stroke (LVOS) require endovascular-capable centers. The FAST-ED was created as a secondary scale to identify LVOS. Currently, there is minimal prospective evidence validating the use of the FAST-ED in the prehospital environment. The purpose of this study was to evaluate the inter-rater reliability of the FAST-ED between patient care providers in the prehospital setting. Methods: This prospective study was conducted between March and May 2018 in a single municipal EMS agency that staffs 2 providers per ambulance with at least one
being a paramedic. Patient inclusion was based on paramedic impression that the patient was experiencing a stroke and greater than 18 years old. A 1-hour didactic training session on the FAST-ED was conducted for all providers the month prior to study initiation. The study was independently performed and documented a FAST-ED assessment on eligible patients. FAST-ED assessments were classified as performed by the primary or secondary care giver. A sub-analysis was performed to determine if kappa changed when the primary and secondary caregivers hold the same level of EMS certification (paramedic). Results: There were 231 patients included in this analysis with an average age of 68.5 years and 135 (58.4%) males. In aggregate, there was 92.2% (Kappa = 0.81) agreement between primary and secondary care giver with minor changes in agreement when comparing paramedic/EMT crews (92.5%; Kappa = 0.82) and paramedic/EMT crews (91.2%; Kappa = 0.80). Inter-rater reliability was substantial at the aggregate level and slightly attenuated when compared to the item level with 70.1% (Kappa = 0.56). Conclusions: This study demonstrated high inter-rater reliability of the FAST-ED scale, in aggregate, when performed in the prehospital setting. Our findings support the conception of FAST as a stroke. There were no differences in reliability based on crew configuration and item level analysis indicated moderate inter-rater reliability.

61. AN INVESTIGATION OF EMERGENCY HEALTHCARE PROVIDERS’ BELIEFS AND THIRD-PERSON PERCEPTIONS OF HYPERTENSION USING CONSTRUCTS OF THE HEALTH BELIEF MODEL

Susan Burnett, University at Albany; American Medical Response of Central New York CATEGORIES OF SUBMISSION: PROFESSIONAL

Background: While emergency healthcare professionals (EHCPs) are equipped with knowledge about hypertension and its treatments, they are not invincible to being diagnosed with the disease. Conditions exist, however, for healthcare providers, to believe that they are not affected by hypertension because of a sense of comparative optimism. We predicted EHCPs would feel they were less susceptible to hypertension than their patients, the condition would be less severe for them, if afflicted, and their motivations to stay healthy would be higher than those they treat. Methods: A survey of 288 EHCPs (mean age = 40.07, SD = 12.29) about their knowledge of hypertension and how the condition affects them. Using constructs from the health belief model (HBM) and third-person perception (TPP), we asked participants about their knowledge of hypertension and health motivations, if they personally felt the condition and if they felt the condition would be severe. Respondents answered similar questions about their perceptions of those elements in patients. Results: As expected, EHCPs have a higher level of knowledge about hypertension and its associated risks and treatments (M = 6.22, SD = 0.50). As hypothesized, EHCPs perceive themselves as more susceptible to hypertension (M = 4.37, SD = 1.10) than they are, themselves (M = 3.73, SD = 1.56), t(178) = -4.63, p < 0.001. They also perceive greater severity in hypertension and its associated negative outcomes for patients (M = 3.2, SD = 1.09) than their own health (M = 3.04, SD = 1.14), t(174) = -2.24, p = 0.03. Furthermore, EHCP’s believe they are more motivated for health maintenance behaviors (M = 4.91, SD = 1.15) than their patients (M = 2.71, SD = 0.97), t(174) = 18.99, p < 0.001. Conclusions: Programs exist to help healthcare workers manage their own health and wellness. Campaigns to address the feelings of TPP in EHCPs are lacking, which can prove dangerous for those who have undiagnosed or poorly treated hypertension. The RESULTS of this-study indicate that future EHCPs will need to reduce morbidity and mortality associated with these problems and improve quality of life for patients and practitioners, alike.

62. EVALUATING PARAMEDIC COMFORT, CONFIDENCE, AND CULTURAL COMPETENCY IN PROVIDING CARE TO TRANS POPULATIONS IN A PROVINCIAL AMBULANCE SYSTEM

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Background: Close to 2 million transgender (trans) individuals live in the United States and Canada. Trans communities frequently report emergency care avoidance and negative health care experiences. Of note, there is currently no research on the paramedic perspective of caring for trans populations. Our objective was to explore paramedic comfort, confidence, and cultural competency in providing emergency care to trans individuals. Methods: A cross-sectional, semi-structured electronic survey was administered by email to paramedics registered with the College of Paramedics of Nova Scotia (n = 1225) from April 9 to May 7, 2018. The survey included previously validated questions from other research reports on general comfort, confidence, and negative health care experiences. Of note, there is currently no research on the paramedic perspective of caring for trans populations. Our objective was to explore paramedic comfort, confidence, and cultural competency in providing emergency care to trans individuals. Results: Of the 3,020 participants, 337 (11%) received ketamine, 2,155 (71%) received a benzodiazepine, and 528 (17%) received an antipsychotic. The median age of all patients was 36 (IQR 23–49), 1,492 (50%) were male, 764 (25%) had a psychiatric history, 192 (7%) had a substance abuse history, and 912 (30%) had admitted or known drug or alcohol use. In the ketamine group, patients received non-invasive ventilation versus 0.3% in the comparison group (n = 9) (OR 2.7, 95% CI 0.72–9.9). Ten percent (n = 34) of ketamine patients received invasive airway management, versus 0.8% (n = 22) (OR 13.6, 95% CI 7.8–23.5). In the ketamine group, 2% (n = 7) of received invasive airway management versus 0.6% (n = 15) (OR 3.8, 95% CI 1.5–9.3). One ketamine patient experienced cardiac arrest vs. 5 in the comparison group (OR 1.6, 95% CI 0.2–13). Conclusions: The adverse event rate for all psychiatric patients administered sedation was ≤5%. For psychiatric patients requiring treatment, those who received ketamine received significantly more airway management than patients who received a benzodiazepine or antipsychotic. Limitations for this study include not knowing patient agitation level or hospital outcomes.

63. INCREASED FREQUENCY OF ADVERSE EVENTS OBSERVED AFTER KETAMINE USE FOR PSYCHIATRIC EMERGENCY AS COMPARED TO BENZODIAZEPINES AND ANTI PSYCHOTICS

Kordik Samuel, Chris Smith, David Page, Remle Crowe, Brent Myers, David Wampler, Cypress Creek EMS CATEGORIES OF SUBMISSION: PROFESSIONAL

Background: Ketamine may be favorable to benzodiazepine use for de-escalation in the prehospital setting. There is limited literature investigating the prehospital treatment of psychiatric patients. Methods: A prospective study was performed using patient care records from the ESO Solutions (Austin, TX) research database from 2017. Inclusion criteria were: patients over 13, received ketamine, benzodiazepine or antipsychotic for psychiatric emergency and receiving a single dose of ketamine, benzodiazepine or antipsychotic. Psychiatric emergencies were defined by dispatch type or patient’s primary impression consistent with psychiatric emergency. Included medications were categorized as ketamine, benzodiazepine or antipsychotic. Adverse events defined as non-invasive airway management (Cricoid Pressure, Manual Airway, NPA, OPA, Suction), non-invasive ventilation (CPAP, BPM), invasive airway management (supraglottic airway, ETT, and cardiac arrest). The frequency of adverse events was compared between ketamine versus benzodiazepines or antipsychotics. Results: Of the 3,020 patients were included, 337 (11%) received ketamine, 2,155 (71%) received a benzodiazepine, and 528 (17%) received an antipsychotic. The median age of all patients was 36 (IQR 23–49), 1,492 (50%) were male, 764 (25%) had a psychiatric history, 192 (7%) had a substance abuse history, and 912 (30%) had admitted or known drug or alcohol use. In the ketamine group, patients received non-invasive ventilation versus 0.3% in the comparison group (n = 9) (OR 2.7, 95% CI 0.72–9.9). Ten percent (n = 34) of ketamine patients received invasive airway management, versus 0.8% (n = 22) (OR 13.6, 95% CI 7.8–23.5). In the ketamine group, 2% (n = 7) of received invasive airway management versus 0.6% (n = 15) (OR 3.8, 95% CI 1.5–9.3). One ketamine patient experienced cardiac arrest vs. 5 in the comparison group (OR 1.6, 95% CI 0.2–13). Conclusions: The adverse event rate for all psychiatric patients administered sedation was ≤5%. For psychiatric patients requiring treatment, those who received ketamine received significantly more airway management than patients who received a benzodiazepine or antipsychotic. Limitations for this study include not knowing patient agitation level or hospital outcomes.

64. HOW DO PARAMEDICS PERCEIVE THEIR ROLE IN THE EMERGENCY DEPARTMENT?

Melissa Snyder, Donald Eby, Schuylkill School of Medicine, Western University CATEGORIES OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Inter-disciplinary interaction in the Emergency Department (ED) is critical for good patient care. The perception of
paramedics’ experience in this interaction is not well described in the literature. This project gives voice to paramedics’ understanding of their role in the ED. Methods: Qualitative thematic framework analysis of digitally recorded, semi-structured, telephone interviews with one urban and one rural Paramedic Service in Southern Ontario. Recordings and field notes were repeatedly reviewed and discussed by 2 researchers. A 2nd iteration of codebooks was constructed from themes emerging from the data. Results: Paramedics interviewed had 7–33 years of primary, advanced, or critical care experience, and major themes emerged. (1) Patient advocate: Paramedics present the patient prehospital context and course of care information. They feel this information is essential to good care and must be communicated. (2) Communication: Concerns raised that information is not listened to and valuable information is lost or ignored. A formal 30-second ‘pause’ for a structured paramedic to ED staff handover was seen as beneficial. Paramedics also want clinical feedback and outcome information from ED staff. No formal handover or handover tool was identified. Respect: When it exists, it is often based upon personal relationships between individuals. Paramedics feel when ED staff don’t understand their scope of practice, their skills and experience are ignored. In smaller EDs, paramedics also see themselves as a resource to help the ED staff with clinical procedure how to do their job. Conclusions: Paramedics perceive themselves as providing valuable information and advocacy for their patients in the ED. In order to present this information, they require uninterrupted time, as short as 30 seconds, for communication. Their relationship with the ED staff is further strengthened by mutual respect and understanding of each discipline’s scope of practice and interdisciplinary teamwork. Paramedics would like more feedback on clinical outcomes and on their prehospital care. Some areas for practice change suggested by this study include: time for un-interrupted communication of prehospital information, formal feedback, and reflection on how to improve interdisciplinary interactions.

65. UTILITY OF GLUCOSE TESTING AND ADMINISTRATION OF GLUCOSE IN PATIENTS IN OUT-OF-HOSPITAL CARDIAC ARREST: A PREHOSPITAL PERSPECTIVE

Tiffany Abramson, Nichole Bosson, Angelica Loza-Gomez, Marianne Gausche-Hill, Marc Eckstein, Rock School of Medicine, University of Southern California CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Many emergency medical services (EMS) treatment protocols for out-of-hospital cardiac arrests (OHCA) continue to include point-of-care (POC) glucose measurement and administration of dextrose despite the American Heart Association removing hypoglycemia as a cause of cardiac arrest for adults from the 2010 guidelines. In-hospital cardiac arrest data suggests that dextrose administration may be associated with worse outcomes. This study describes the incidence of hypoglycemia among adult in-hospital cardiac arrest patients treated by EMS for OHCA and subsequent patient outcomes within a large, regional system. Methods: This is a 6-year retrospective analysis of all adult cardiac arrest events treated by paramedics from 2011–2017 with available prehospital data. Patients ≥18 years old with non-traumatic OHCA and attempted field resuscitation were included. Hypoglycemia was defined as glucose <60 mg/dL. Data on glucose levels, dextrose and/or glucagon administration, and outcomes were extracted from EMS data registries. Survival to hospital discharge (SHD) and neurologic outcome for transported patients were extracted from cardiac arrest receiving centers. The primary outcomes were frequency of POC glucose measurement, hypoglycemia, and dextrose administration in OHCA for patients with hypoglycemia, including field return of spontaneous circulation (ROSC), SHD and survival with good neurologic outcome, defined as cerebral performance category (CPC) 1 or 2. Overall outcomes serve as a system reference. Descriptive statistics are presented, including frequencies and proportions. Results: There were 46,211 OHCA during the study period. Glucose levels were measured in 33,851 (73%) cases, of whom 2,335 (7%) were hypoglycemic. Among hypoglycemic patients, 929 (40%) received dextrose and an additional 30 patients received glucagon by EMS. Field ROSC was achieved in 286 (30%) of patients who received dextrose and/or glucagon. Survival was determined for 1,714 of the hypoglycemic cases: 120 (7%) had SHD and 66 (55%) of survivors had good neurologic outcome. Among survivors with hypoglycemia, 40% were treated in the field. SHD for all OHCA was 8%, 2,751 of 33,679 patients known outcomes, and 1,567 (57%) of survivors had good neurologic outcomes. In this regional EMS system, hypoglycemia and dextrose administration in OHCA were rare events. Outcomes for patients with hypoglycemia were similar to overall outcomes within the same system.

66. ASSOCIATION BETWEEN NEIGHBORHOOD CARdioPULMONARY RESUSCITATION TRAINING: EXPERIENCES AND CHANGES IN SURVIVAL OUTCOMES AFTER OUT-OF-HOSPITAL CARDIAC ARREST OVER 5 YEARS: A MULTILEVEL ANALYSIS

Young Sun Ro, Kyoun Jun Song, Sang Do Shin, Seoul National University Hospital CATEGORY OF SUBMISSION: CARDIAC

Background: Associations between neighborhood environments and survival outcomes after out-of-hospital cardiac arrests (OHCAs) have been proposed. The purpose of this study was to explore the association between neighborhood cardiopulmonary resuscitation (CPR) training experience and improvements in survival outcomes after OHCA over 5 years. Methods: Emergency medical service (EMS)-treated OHCA with cardiac etiology between 2012 and 2016 were analyzed, excluding cases managed only by EMS providers. The main exposure of interest was CPR training experiences at the community level, which was surveyed and measured in 254 counties in Korea in 2016. Proportion of positive answer for CPR training experience was used among about 1,000 respondents who were selected with a novel stratification method in each county for annual Community Health Survey. The endpoint was survival with good neurologic recovery after OHCA. We compared the difference of risk-adjusted outcomes between 2012 and 2016 among the neighborhoods of communities by the proportions of residents with CPR training experiences using a difference-in-differences design. Demographic and Utstein factors and CPR training experience (aggregate factor) were used in the multilevel analysis. Results: A total of 81,250 OHCA in 254 communities were analyzed. The risk-adjusted good neurological recovery rates increased from 5.4% in 2012 to 7.1% in 2016 ([adjusted rate difference: 1.6% (1.2–2.1)]. The OHCA that occurred in communities with the highest proportions of residents with CPR training experiences were more likely to survive with good neurological recovery [adjusted rates: 5.2% in 2012 and 7.4% in 2016, difference: 2.2% (1.5–2.9)] than those were occurred in the lowest CPR training communities [adjusted rates: 5.9% in 2012 and 6.0% in 2016, difference: 0.1% (–1.1 to 1.2)]. The difference-in-differences was 2.1% (0.8–3.3). Conclusions: A high proportion of neighborhood CPR training experience was associated with significant improvements over 5 years in good neurological recovery rates after OHCA in the communities. The neighborhood CPR training experience can be considered as a potential candidate for monitoring effect of an implemented CPR program.

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Background: Glucagon is a critical alternative for hypoglycemic patients who are unable to tolerate oral glucose administration (IV) access. While intranasal (IN) glucagon has demonstrated pharmacologic efficacy, it is easily administered, and does not carry a risk of needlestick injury, its effectiveness in the prehospital realm has yet to be established. We present a case series of patients treated with prehospital IN glucagon and explore its effectiveness in treating hypoglycemia. Methods: We conducted a retrospective chart review of patients administered IN glucagon via mucosal atomization device from January 2015 to May 2018 in a large urban EMS system. The primary outcome was change in patient’s clinical condition post-administration as determined by the treating paramedic. Secondary outcomes were change in blood glucose level and proportion of patients with post-administration glucagon level ≥80 mg/dL. Descriptive statistics were performed using STATA 12.1. Results: A total of 131 patient encounters were identified. In 64 (48.8%) cases, co-administration of oral glucose, IV dextrose, IM glucagon, or other medications (e.g., naloxone) occurred. In patients receiving only IN glucagon (n = 67), paramedics reported an improved patient condition in 37 (55.2%), with no reported clinical deterioration. The median change in glucose level for those receiving only IN Glucagon with pre and post glucose levels recorded (n = 38) was +5 mg/dL (IQR 0–16 mg/dL, range 34–167 mg/dL), with 29% (29/100) reaching ≥60 mg/dL. Of all patients for whom repeat glucose level was checked ≥15 minutes post-administration (n = 35), median change in glucose level was +21 mg/dL (IQR 0–88 mg/dL, range 31–312 mg/dL), with 15 (42%) having a repeat glucose level of ≥60 mg/dL. Conclusions: In this limited case-series, IN glucagon has demonstrated promise in improving clinical condition in the majority of patients with prehospital hypoglycemia as reported by treating paramedics. However, improvement in blood glucose level was modest when measured soon after IN glucagon administration. Future controlled studies are needed to determine the effectiveness of
Background: Abdominal pain is one of the most common reasons people call 9-1-1 to request an ambulance. Although 85% of 9-1-1 incidents for abdominal pain require advanced life support (ALS) resources, sometimes with the closest first responder unable to provide ALS, the closest BLS ambulance responded alone. In 2015, a large urban fire department implemented an internally developed tiered dispatch system. Under this dispatch system, patients reporting a chief complaint of abdominal pain received the closest BLS ambulance dispatched alone, emergency if located within 3 miles of the incident.

Methods: The objective was to determine how many patients with abdominal pain required advanced life support resources for a time-sensitive intervention. This was a retrospective review of electronic medical records for 9-1-1 incidents with a chief complaint of non-traumatic abdominal pain from May 2015 to May 2018. Patients were included if the patient's chief complaint was abdominal pain, the patient was the caller or was in close proximity to the caller (i.e., first or second party call), the patient was over age 15, and the patient was awake and alert. The primary outcome was the prevalence of time-critical prehospital ALS intervention, defined as CPR: defibrillation; airway management (including use of bag-valve-mask, supraglottic airway, or endotracheal intubation); the presence of hypotension (defined as initial systolic blood pressure <90 mm Hg); or the prehospital 12-lead electrocardiogram showing STEMI or wide complex arrhythmia. Descriptive statistics are presented, including frequencies.

Results: Statistics are presented, including frequencies. Of the 486,116 patients transported from 9-1-1 incidents in the 2015-2018 period, 47,395 (9.76%) patients with abdominal pain were included in the analysis. The BLS/ALS dispatcher or second party caller determined the most likely reasons why patient placement was required on the LSB and why the LSB was removed for EMS transport. Of the 47,395 patients with abdominal pain, 4,499 (9.47%) required ALS resources for a time-sensitive intervention. A 12-lead electrocardiogram was obtained in 7,132 cases (0.07%). CPR was required in 6 cases (0.02%), defibrillation in 1 case (0.00%), airway management in 13 cases (0.04%), and hypotension occurred in 242 cases (0.07%). A 12-lead electrocardiogram was obtained in 2,213 abdominal pain dispatches (7.03%) of which 9 (0.03%) showed STEMI and 1 (0.001%) showed wide complex arrhythmia. Conclusions: Among adult 9-1-1 patients with a chief complaint of abdominal pain, the need for ALS intervention was exceedingly rare. Dispatching a BLS ambulance without a first responder appears to be safe.
patients within 72 distinct dispatch complaint codes encountered the ETHAN protocol. We identified 12,523 among 44 dispatch complaint codes that met our definition. Of those, 91% (95% CI: 91–92) patients were dispositioned by emergency physicians for alternate transport. Moreover, the mean physician talk-time was 5.2 minutes and these patients were exclusive to 12 dispatch complaint codes. The mean age was 44 years (range 1–99 years), 52% were female and no patient adverse events were reported.

Conclusions: In this population, emergency physician led telehealth alternate transport dispatch codes were significantly associated with EMS dispatch complaint codes. Further research is warranted to understand if these ePatient telehealth codes could be integrated into the dispatch phase of EMS systems with tiered responses.

72. PAIN ASSESSMENT AND ANALGESIA IN PEDIATRIC TRAUMA PATIENTS DURING HELICOPTER EMERGENCY MEDICAL SERVICES (HEMS)

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Background: Pediatric trauma patients transported by emergency medical services (EMS) rarely have their pain assessed and few receive analgesia. In 2014, protocol changes were implemented in a local HEMS service that included didactic training for pediatric analgesia, the addition of the Wong-Baker and FLACC scales for pain assessment, and standing orders for opioid pain medication without medical consultation. The aim of this study is to assess whether these protocol changes have improved prehospital pain assessment and analgesic administration to pediatric trauma patients. Methods: We reviewed patient records 2 years before and after the date of protocol change. Inclusion criteria consisted of patients transported via HEMS, age <15 years, and a chief complaint of traumatic injury. Exclusion criteria included allergies to opioid, intoxication, and consensually directed as a maximum systolic blood pressure <70–2 (age). The primary outcome was a reduction in pain score while secondary outcomes included changes in proportion of pain assessments and administration of analgesia to patients receiving opioid. Results: A total of 534 pediatric patients with traumatic injuries were transported via HEMS before protocol change and 491 after change. Pain assessment occurred in 252/483 (52.6%) of eligible patients before protocol change and 283/454 (62.3%) after change (p = 0.002). Rates of patients who had any pain assessment ≥5, administration of an opioid occurred in 62/76 (81.6%) before protocol change and 80/91 (87.9%) after change (p = 0.253). Of patients who had any pain assessment, severe pain score ≥7 was present in 56/160 (35.0%) before protocol changes and 75/92 (81.5%) after changes (p = 0.077). Of patients with any non-zero pain score, 87/160 (54.4%) of patients had a reduction in pain score ≥1 prior to the protocol change and 97/177 (54.8%) after the change (p = 0.937).

Conclusions: The 2014 protocol changes are associated with increased incidence of pain assessment in pediatric trauma patients but did not significantly affect the incidence of opioid administration, final pain score, or the final opioid choice with an improved pain score. Further changes to protocols are warranted to address oligoanalgesia in this population.

73. PRELIMINARY EVALUATION OF THE AMERICAN HEART ASSOCIATION TERMINATION OF RESUSCITATION CRITERIA IN THE PEDIATRIC POPULATION USING THE CARDIAC ARREST REGISTRY TO ENHANCE SURVIVAL

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Background: Survival for patients with out-of-hospital cardiac arrest (OHCA) is known to vary widely across patient ages, with the lowest in infants <1 year of age. The American Heart Association (AHA) basic life support (BLS) and advanced life support (ALS) guidelines for field termination of resuscitation (FTOR) are not recommended for pediatric patients. We sought to compare the accuracy of variants of these FTOR models in identifying pediatric OHCA patients who do not survive. Methods: The Cardiac Arrest Registry to Enhance Survival (CARES) identified 4,623 OHCA patients under the age of eighteen with a sample of 174,009 OHCA codes. We applied 3 variants of AHA FTOR criteria: (BLS1) Arrest unmissed by BLS, no return of spontaneous circulation (ROSC), no non-ROSC resuscitation; (BLS2) Unwitnessed arrest, no ROSC, and no defibrillation; and (ALS) Unwitnessed arrest, no bystander CPR, no ROSC, and no defibrillation. CARES records whether sustained ROSC was achieved, which was used as a surrogate for ROSC in the AHA criteria models. The positive predictive value (PPV) was calculated for each set of FTOR criteria, along with the percentage and number of patients reported who met each model but survived to discharge. The data was analyzed in the following inclusive age groups: <1 year, 1–7 years, 8–12 years, and 13–17 years old.

Results: When applying the 3 models across these age groups, BLS2 in <1-year-old group had a PPV of 0.954 (95% CI: 0.967–0.996; 0.6% left behind [14/1,817]) and ALS in <1-year-old group had a PPV of 0.994 (95% CI: 0.987–0.995; 0.6% left behind [6/1,100])). All other models and pediatric age ranges were associated with ≥1% survival. When applied to the <1-year-old group, 69.4% of the BLS2 group and 38.2% of the ALS group would have been captured by the criteria, compared to 31.3% and 18.4%, respectively, for adults. Conclusions: More pediatric patient models meet FTOR criteria for FTOR than adults, but the ALS FTOR criteria for patients <1 year of age was the only model and age range that predicted less than 1% survival. This study ignores the emotional impact of FTOR in children, which has important implications.

74. PARAMEDICS PROVIDING PALLIATIVE CARE AT HOME: A RETROSPECTIVE COHORT COMPARING SYMPTOM MANAGEMENT OF BREATHLESSNESS AND PAIN IN CANCER VS NON-CANCER CONDITIONS

Brianne Robinson, Alix Carter, Judah Golentz, Michelle Hultin, Marianne Arab, Dalhousie Medical School CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: In Nova Scotia, under the Paramedics Providing Palliative Care programs, paramedics can now manage symptom crises in patients with palliative goals of care and often required to transport to hospital. Growing recognition that non-cancer conditions benefit from a palliative approach is expanding the program. Our team previously found treatment of pain and breathlessness is not optimized, pain scores are underestimated, and FTOR is more comfortable (pre-launch) with a palliative approach in cancer vs. non-cancer conditions. Our objective was to compare symptom management in the paramedic cancer vs. non-cancer subgroup.

Methods: We conducted a retrospective cohort study. The Electronic Patient Care Record and Special Patient Portal were queried for patients with palliative goals from July 1, 2015 to July 1, 2016. Descriptive analysis was conducted and results were compared with a t-test and Bonferroni correction (α = 0.007).

Results: 1,099 unique patients: 765/1,909 (40.1%) cancer and 1,144/1,909 (59.9%) non-cancer. Female sex: cancer 357/765 (46.7%), non-cancer 538/1,144 (47.0%). Mean age cancer: 73.3 (11.65), non-cancer 77.7 (12.80). Top non-cancer conditions: COPD (495/1,144, 43.3%), CHF (322/1,144, 28.1%), stroke (172/1,144, 15.0%) and dementia (149/1,144, 13.0%). Comorbidities for cancer patients (range): 0 to 3; non-cancer 0 to 5. Most common chief complaint (CC) for cancer and non-cancer: respiratory distress, 10.8% vs. 21.5%. Overall, no difference in proportion of cancer treated vs. non-cancer, 11.5% vs. 10.1%; p = 0.35. Some difference in individual therapies: morphine 83/765 (10.8%) vs. 55/1144 (4.8%), p < 0.001; hydromorphone 9/765 (1.2%) vs. 2/1,144 (0.2%), p = 0.014, salbutamol 38/765 (5.0%) vs. 5/1,144 (0.4%), p < 0.001 and ipratropium 27/765 (3.5%) vs. 134/1,144 (11.7%), p < 0.001, in addition to any support with home medication that is not querable. Pre-treatment pain scores were documented more often than post-treatment in cancer groups [58% vs. 55.4% vs. 26.9%; p = 0.0001]. Conclusions: Non-cancer patients represent an important proportion of palliative care calls for paramedics. Cancer and non-cancer patients had very similar CC and received similar treatment, although low proportions, despite pre-launch findings that non-cancer conditions were likely to be undertreated. Pain scores remain underutilized. Further research into the underlying reason(s) is required to improve the support of non-cancer patients by paramedics.

75. PATIENT RISK OF REFUSAL BASED ON DISPATCH COMPLAINT: A RETROSPECTIVE ANALYSIS

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Background: Patients who refuse emergency department (ED) transport after emergency medical service (EMS) dispatch have been shown to have significant risk to EMS systems. Current EMS literature has shown varying results regarding the characteristics and demographics of patients who refuse EMS care. The objective of this study was to identify and explore the current demographics and characteristics of patients who refuse EMS transport.

Methods: The Delaware EMS activation database for 2017 was retrospectively reviewed. Logistic regression analysis was used to evaluate patient characteristics on likelihood of decision for transport. Results: Delaware EMS responded to 113,879 incidents in 2017 with 108,249 (95%) having complete information for analysis. In the cases analyzed there were 9,730 refusals of transport (9%). There was weak correlation (r < 0.1) for age,
gender, and season. The most common dispatch complaints when transport was refused were Traffic Accident (16.7%), Falls (16.4%), Sick Person (10.1%), and Diabetic Problem (8.2%). With logistic regression analysis compared to Sick Person the highest odds of refusal were Falls (OR = 8.64; 95% CI: 9.83–760.25), Strange Odor (OR = 48.63; 95% CI: 11.70–202.17), Gas Leak (OR = 29.90; 95% CI: 11.69–76.51), and Water Rescue (OR = 21.56; 95% CI: 3.55–132.51). The most common EMS provider primary impression for patients who refused transport were No Apparent Injury (27.3%), Pain (11.1%), Other (11.0%), and Hypoglycemia (5.0%). Logistic regression showed highest primary impression odds of refusal were Patient Assist (OR = 17.11; 95% CI: 9.56–30.61), Hypoglycemia (OR = 10.16; 95% CI: 7.75–13.31), and No Injury (OR = 5.35; 95% CI: 4.19–6.83).

Conclusions: Among major TBI patients with prehospital HT, those with MTBI were much more likely to have been refused transport than those with TBI (OR = 0.14 (95% CI: 0.06–0.30)). However, this association varied dramatically with TBI severity. In mod/severe TBI cases with HT, there was no identifiable mortality difference. Thus, in cases with substantial potential to survive the primary brain injury (mod/severe), outcome is markedly worse in patients with multissystem injuries. However, in very/extremely severe TBI, non-head region injuries have a much greater impact on mortality. This may be because the TBI is the primary factor leading to death in these cases. The main EPIC study is evaluating whether this severity-based difference in “effect” has implications for TBI guideline treatment effectiveness.

77. OPPORTUNITIES FOR EMERGENCY MEDICAL SERVICES INTERVENTION AND PREVENTION OF OPIOID OVERDOSE MORTALITY
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Background: The opioid crisis is a growing cause of pain and suffering. States and communities may be mitigated by innovative approaches to identifying individuals at-risk of fatal opioid overdose. We examined Emergency Medical Services (EMS) utilization among a cohort of individuals who died from opioid overdose in order to identify opportunities for intervention.

Methods: Individuals who died of unintentional opioid overdose in a large North Carolina (NC) county between January 1, 2014 and December 31, 2016 were studied in a retrospective cohort. Death records obtained from North Carolina Vital Records were linked to EMS patient care records obtained from the county EMS system to determine the number of encounters each decedent had with EMS in the year preceding their death. Patient demographics and EMS encounters were analyzed to identify encounter types that may be targeted for intervention. Findings were used to help evaluate the statistical significance of differences in group proportions.

Results: Of the 218 individuals who died from unintentional opioid overdose in the study interval, 30% (n = 66) utilized EMS in the year before their death and 17% (n = 36) had at least one EMS encounter with documented drug or alcohol use (i.e., “drug-related encounter”). The mean age at death was 38 (range 19–74) years, 30% were female, 89% were White, and 8% were Black/African American. Factors associated with higher incidence of EMS utilization included gender, age, and race. Decedents aged 55–65 had the highest EMS utilization (47%) and patients aged <25 and 25–35 had more drug-related EMS encounters (29% and 20%, respectively). The most common reasons for EMS utilization were “other medical” (27%), “non-traumatic pain” (20%), “traumatic injury” (16%), and “posed to injury” (14%). Drug or alcohol use was documented by EMS in 33% of all encounters and an opioid prescription was reported in 22% of encounters. Conclusions: Identifying individuals who died from accidental opioid overdose utilized EMS in the year before their death and nearly one-fifth had a drug-related encounter. EMS encounters may present an opportunity to identify a substantial percent of individuals at-risk for fatal overdose and, ultimately, reduce overdose mortality.

78. IMPLEMENTATION OF A MEDICAL AMNESTY/GOOD SAMARITAN POLICY BY A LARGE PUBLIC UNIVERSITY: IS NOT ASSOCIATED WITH AN INCREASE IN EMERGENCY MEDICAL SERVICES (EMS) ALCOHOL RELATED PATIENT ENCOUNTERS

Background: Excessive and underage alcohol consumption on U.S. college campuses is a significant problem despite systematic interventions. One environmental level strategy to reduce alcohol-related harm is the Medical Amnesty/Good Samaritan (MAGS) policy which eliminates sanctions against students seeking help with non-severe instances of either serious harm or death from alcohol use promoting prompt medical evaluation and transport. The goal of this study is to determine if there was an increase in alcohol related Emergency Medical Services (EMS) call volume associated with implementation of a MAGS policy at a large public university campus.

Methods: This retrospective review was conducted using patient care records (PCRs) from a collegiate EMS agency responding exclusively to on-campus 9-1-1 calls. Based on changes in dispatch method and agency response zone, only call data from 23 recognized undergraduate residence halls was analyzed. The incidence of total and alcohol related 9-1-1 calls were compared between one academic year (AY) prior to (pre-MAGS, AY2015) and 2 years after MAGS implementation (post-MAGS, AY2016/17).

Results: Over the 3 year study period, 706 PCRs were generated and none excluded as all were complete. There were 221 pre-MAGS and 485 post-MAGS total 9-1-1 calls during AY2015 and 2016/17, respectively. There were 115 (52.0%) pre-MAGS and 238 (49.1%) post-MAGS alcohol related 9-1-1 calls during AY2015 and 2016/17, respectively. RR 0.94 (95% CI: 0.81–1.10; n = 0.465).

Conclusions: Implementation of a MAGS policy eliminating sanctions against students when concerned about alcohol related harm was not associated with a significant change in the number of alcohol related 9-1-1 calls from undergraduate residence halls at a large public university.Further research evaluating the effectiveness of MAGS policy interventions to determine if this intervention leads to increased EMS system utilization is indicated.

79. EVALUATING THE IMPLEMENTATION OF A NEW T-CPR PROTOCOL IN AN URBAN 9-1-1 DISPATCH CENTER
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Background: More than 350,000 people experience out of hospital cardiac arrest (OHCA) each year in the United States (US). The average survival rate in the US is about 10.6%. Survival rate can improve up to 20% in communities with strong bystander cardiopulmonary resuscitation (CPR) programs. The American Heart Association has a Class 1 recommendation of initiating Telephone-CPR (T-CPR) for unresponsive patients who are not breathing normally. This study aimed to describe the frequency of correctly identified cardiac arrest (CA) cases in a 9-1-1 Dispatch Center before and after implementation of a new T-CPR protocol.

Methods: This is a retrospective analysis of a 9-1-1 Dispatch Center type code over a 30 month period. The Dispatch Center is a 2nd public safety answering point for 14 fire agencies.

Results: The new T-CPR protocol consisted of asking the reporting party if the patient was “conscious” and if patient was “breathing normally.” If answer was “no” to both questions, then the 9-1-1 dispatch assisted hands only CPR would proceed. CA chief complaint incidents were obtained from electronic patient care records obtained from the field. A call was considered to dispatch call type codes 12 months prior to protocol implementation and 18 months after.

Description of data presented in proportions, with corresponding p-value and 95% CI from chi-square analysis. Results: A total of 1,460 cardiac arrest cases were analyzed during the study period. Out of the 564 CA cases protected by dispatch, 46% (257/564) were correctly identified by dispatch. Out of the 896 CA cases after protocol implementation, 55% (490/896) were correctly identified by dispatch. This is an improvement by 9%. (p = 0.0008 [95% CI: 3.73–14.19]). The most commonly missed type code prior to protocol implementation was “Unconscious” at 42% (128/307), followed by “Breathing Difficulty” at 20% (60/307), and “Fall” at 3% (9/307) compared to “Unconscious” at 40% (162/406), followed by “Breathing Difficulty” at 38% (72/188) and “Altered Level of Consciousness” at 7% (28/406) after protocol implementation. Conclusions: The implementation of a new T-CPR protocol in an urban dispatch center improved CA cardiac arrest identification by 9-1-1 dispatchers.

80. WHAT ARE THE ETIOLOGIES OF CHEST COMPRESSION PAUSES DURING OUT-OF-HOSPITAL CARDIAC ARREST RESUSCITATION?

Jonathan Hanisch, Andrew Latimer, Michael Sayre, Thomas Rea, Michelle Olsufka, Lihua Yin, Leonard Cobb, Catherine Counts, University of Washington School of Medicine CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Frequent and prolonged pauses in chest compressions have been shown to contribute to poor outcomes in out-of-hospital cardiac arrest (OHCA). The objective of this retrospective observational study was to characterize the frequency, reasons, and duration of these pauses in chest compressions.

Methods: OHCA audio recordings, ECG rhythm, and impedance chest compression data were captured using either the LIFEPAK 1000 (LIRFPAK) or the Airway-Q (Air-Q) defibrillator (Physio-Control). All OHCA patients who received chest compressions from Seattle Fire Department between 2007–2015 were included. Variables collected included CPR start time, CPR stop time, and compression pause duration. Pauses greater than 1 second were classified into categories based on interpretation of audio recordings.

Results: We analyzed 26,856 pauses from 3,243 OHCA cases from January 2007 and December 2015. Among all pauses ≥1 second, median pause duration decreased from 14 seconds (IQR 8–23 sec) in 2007 to 7 seconds (IQR 5–11 sec) in 2015. Among all pauses ≥10 seconds, median pause duration decreased from 20 seconds (IQR 15–28 sec) in 2007 to 15 seconds (IQR 12–21 sec) in 2015. The median total pause duration per case decreased from 110 seconds (IQR 52–195.5 sec) in 2007 to 72 seconds (IQR 38–123 sec) in 2015. Pauses for combined rhythm-check and pulse-check accounted for 29.7% of total pause time, with an overall median pause duration of 9 seconds (IQR 6–14 sec). Other significant pause etiologies included,” Breathing Difficulty” at 24% (8,034/33,534), intubation (18 sec, 10–33 sec), moving the patient (12 sec, 7–21 sec), and defibrillation (5 sec, 4–7 sec). Conclusions: Median pause duration of all pauses decreased by 50% from 2007–2015. Combined rhythm-check and pulse-check was the most common pause etiology. Limitations include the lack of data generalizability due to a retrospective analysis of a single EMS system. Strengths include that the reasons for pauses were abstracted from audio recordings of the resuscitation. While significant pauses of common etiologies should continues to be a focus of resuscitation education and quality improvement.

81. SUPRAPULMONARY AIRWAY DEVICES VARY IN GENERATE NEGATIVE INTRATHORACIC PRESSURE DURING AUTOMATED CARDIOPULMONARY RESUSCITATION WITH AND WITHOUT AN IMPEDANCE THRESHOLD DEVICE

Joe Holley, Johanna Moore, Michael Jacobs, Scott Youngquist, Bayert Salverda, Carolina Rojas-Salvador, Ralph Risicone, Charles Lick, Keith Lurie, Department of Emergency Medicine, University of Tennessee, MEMPHIS CATEGORY OF SUBMISSION: CARDIAC

Background: Negative intrathoracic pressure (ITP) during the decompression phase of cardiac resuscitation (CPR) is essential to refill the heart, lower intracranial pressure, maintain coronary and cerebral perfusion, and improve survival. Human studies have shown an impedance threshold device (ITD) can increase effective CPR performance. However, studies have not been tested in the prehospital environment. The primary objective of this study is to measure the relationship between airway pressure during transfer and patient outcomes.

Methods: A retrospective cohort study of mechanically ventilated patients transferred by air ambulance to a single 812-bed Midwestern academic medical center from July 2013 to May 2018. Prehospital sedation and mechanical ventilation, in-hospital mortality, and need for neurosurgical procedures. Univariate analyses were used to measure the association between sedatives (and drug combinations) and clinical outcomes. Multivariable models adjusted for potentially confounding covariates to measure the impact of predictors on delirium and mortality.

Results: Three hundred twenty-seven patients were included. Among those patients, 156 (47.7%) received benzo diazepines, 155 (47.4%) received opiates, 14 (27.5%) received etomidate, 11 (21.9%) received propofol, and 27 (33.5%) received ketamine. Patients were compared with a mean increase of 2.9 days in the hospital (95% CI: 0.7–5.1). In multivariable modeling, for every one-unit increase in prehospital RASS score (RASS < −2), there was a 24% decrease in odds of death (OR, 0.76; 95% CI: 0.65–0.90); for every one-unit increase in emergency department (ED) RASS score, there was a 17% decrease in odds of death (OR, 0.83; 95% CI: 0.70–0.99). Delirium was not associated with prehospital or ED RASS scores. Conclusions:
Benzodiazepines were the most commonly administered prehospital sedative and are associated with increased hospital length-of-stay. Deep sedation in both the prehospital and ED settings was associated with increased mortality. Sedative administration during air transport is a modifiable risk factor and requires prospective study.

83. VALIDATION OF AMERICAN HEART ASSOCIATION TERMINATION OF RESUSCITATION CRITERIA AND COMPARISON TO SHIBAHASHI CRITERIA IN A UNITED STATES OUT-OF-HOSPITAL CARDIAC ARREST POPULATION

Mark Olaf, Douglas Kupas, Anne Knorr, Andrea Berger, CARES Surveillance Group, Grösing, et al.

**Systematic Category of Submission:** Cardiac

**Background:** The American Heart Association (AHA) guidelines contain basic life support (BLS) and advanced life support (ALS) criteria for field termination of resuscitation (RSI). Shibahashi recently proposed new FTOR criteria for adult patients that are more objective than the AHA criteria and do not require an attempt at resuscitation prior to application. We sought to compare the AHA and Shibahashi models in identifying out-of-hospital cardiac arrest (OHCA) patients who did not survive to hospital discharge.

**Methods:** We used the Cardiac Arrest Registry to Enhance Survival (CARES) database to identify 169,386 adult OHCA patients. We applied 3 variants of AHA FTOR criteria (BLS1) Arrest un witnessed by EMS, no return of spontaneous circulation (ROSC), no defibrillation, and non-defibrillation (basic life support; BLS2) Unwitnessed arrest, no ROSC, and no defibrillation, and (advanced life support; ALS) Unwitnessed arrest, no bystander CPR, no ROSC, and no defibrillation. Additionally, Shibahashi FTOR criteria were applied: age >73 years, unwitnessed arrest, and non-shockable initial rhythm. CARES records whether sustained ROSC was achieved, which was used as a surrogate for ROSC in the AHA criteria models. The Positive predictive value (PPV) was calculated for each set of FTOR criteria, along with the percentage and number of patients reported who met each model but survived to discharge.

**Results:** BLS1 criteria demonstrated a PPV of 0.996 (95% CI: 0.996–0.996) with respect to identifying those who would not have survived to hospital discharge, with a “left behind” rate of 0.4% [304/75,223]. BLS2 criteria demonstrated a PPV of 0.997 (95% CI: 0.997–0.998; 0.3% left behind [144/3,003]). ALS criteria demonstrated a PPV of 0.997 (95% CI: 0.997–0.997; 0.3% left behind [101/31,179]). Finally, the Shibahashi criteria have a PPV of 0.984 (95% CI: 0.982–0.982; 1.6% left behind [341/21,181]). The percentage of patients that meet criteria for each model for FTOR are 44.4% for BLS1, 31.3% for BLS2, 18.4% for ALS, and 12.5% for Shibahashi.

**Conclusions:** The AHA FTOR criteria are associated with fewer survivors left behind and identify more candidates for FTOR than the Shibahashi criteria. BLS1 criteria have the most opportunity for FTOR, while Shibahashi criteria identified a modest number of patients for which resuscitation need not be initiated.

84. PERFORMING RAPID SEQUENCE INTUBATION EN ROUTE VIA HELICOPTER IS ASSOCIATED WITH LOWER INTUBATION SUCCESS

Daniel Davis, David Olvera, David Stuhlmiller, Allen Wolfe, Air Methods Cooperation Category of Submission: Medical

**Background:** The most appropriate location to attempt an advanced airway in the prehospital setting has been a topic of discussion for many years. The purpose of this study is to explore intubation success for air medical flight crews during helicopter transport. Methods: This was a retrospective review of the air medical flight crews of all patients requiring rapid sequence intubation (RSI) in the prehospital setting with a national air medical transport company. After completion of a flight, the crew completed an airway continuous quality improvement (CQI) form documenting multiple aspects of the procedure. For this analysis, all patients undergoing RSI by air medical providers were included. Patients in whom the RSI procedure was performed en route via helicopter were compared to other patients with regard to intubation success (overall success, first attempt success, and first attempt success without oxygen desaturation). Multi-variate logistic regression was used to explore the association between RSI performance en route via helicopter and intubation success after adjusting for multiple co-variables (traumatic mechanism, age, gender, and anticipation of a difficult airway based on HEAVEN criteria (Hypoxemia, Extreme Resuscitation Difficulties, Vomit/blood/fluid in the airway, Exsanguination, Neck mobility issues)).

**Results:** A total of 8,861 RSI patients were included with an overall intubation success rate of 97%. A total of 674 (7.6%) underwent the procedure en route via helicopter, with lower overall intubation success vs. other patients (OR 0.64, 95% CI: 0.50–0.81, p = 0.0011) but similarly first attempt success (89.8% vs. 91.3%, p = 0.171) and first attempt success without desaturation (88.1% vs. 89.3%, p = 0.85). Patients undergoing RSI en route via helicopter had fewer HEAVEN predictors of a difficult airway (0.88 vs. 1.15, p < 0.001). After adjusting for multiple co-variables, performing RSI en route via helicopter was associated with lower overall intubation success (OR 0.34, 95% CI: 0.23–0.50, p = 0.001), first attempt success (OR 0.64, 95% CI: 0.49–0.84, p = 0.020), and first attempt success without oxygen desaturation (OR 0.68, 95% CI: 0.53–0.88, p = 0.0032).

**Conclusions:** Performing RSI en route via helicopter is associated with lower intubation success rates. Air medical crews need to appropriately triage select patients with fewer difficult airway predictors for RSI en route, with similar first attempt intubation success rates as a result.

85. CASE SERIES ILLUSTRATING ADVERSE REACTIONS TO PREHOSPITAL ADMINISTRATION OF LOW DOSE KETAMINE FOR PAIN CONTROL

Nicolas Enriquez, Yousef Janaireh, Jeffrey Tolson, K. Moses Mhayagumaru, Amber Rice, Jennifer Smith, Daniel Spalte, Scott Draper, Michael Duncan, Joshua Gaiters, University of Arizona College of Medicine Category of Submission: Student, Resident, Fellow

**Background:** Adverse reactions with ketamine intravenously (IV) in the prehospital setting have been presented. However, no study has looked at the frequency of adverse reactions with low dose (<0.2 mg/kg) or low dose (<0.2 mg/kg) ketamine. Results: Ketamine was administered to 31 patients with pain from both traumatic and medical causes. Adverse reactions were reported in 7 patients with 2 patients experiencing 2 adverse reactions. Adverse reactions reported included: asymptomatic hypertension (4), tachycardia (1), hallucinations (1), hypotension (1), emesis (1), and CNS depression (1). Ketamine dose ranged from 0.17 mg/kg to 0.29 mg/kg. Six of the 7 patients with reported adverse reactions were given a dose over 0.2 mg/kg.

**Conclusions:** When given at a low dose ketamine represents an attractive alternative for pain control in the prehospital setting. Although in this small study, no conclusion can be reached regarding the incidence of adverse reactions to prehospital sub-dissociative dose ketamine, it is important to remember that no drug is without the potential for adverse effects. When administering ketamine for pain control, EMS providers should both be aware of potential adverse reactions and balance the risk of the adverse reaction with the potential benefit of improved pain control.

86. CHARACTERISTICS OF SCENE-TRAUMA PATIENTS DISCHARGED WITHIN 24 HOURS OF AIR MEDICAL TRANSPORT

Christopher Gilliam, David Evans, Chance Spalding, Josh Burton, Howard Herman, The Ohio State University College of Medicine Category of Submission: Student, Resident, Fellow

**Background:** Helicopters play an important role in trauma however this service comes with safety risks, high transport costs, and downstream care charges. Our objective was to determine the types of scene-trauma patients who can be appropriately discharged pre-hospital trauma patients (<24 hours length of stay) in order to reduce over-triage.

**Methods:** Eligible patients included adult scene-trauma patients transported by helicopter to a Level 1 trauma center over a 2 year period. Patient factors such as age, gender, loaded miles, payer source, and transportation costs were collected. Additionally trauma type, mechanism of injury, injury severity score (ISS), revised trauma score (RTS), and prehospital vital signs were documented. Driving distances between home of record to local hospital and home of record to the Level 1 Trauma Center were calculated.

**Results:** 153 out of 584 total patients (26.2%) were discharged within 24 hours of helicopter transport from the accident scene to trauma center. The average age of early discharged patients was 40.46 ± 15.26 with 73.9% being male. The average loaded miles was 50.51 ± 14.99 with average transport charges being $27,921.19 ± $5,356.61. Only 2% of patients were age 70 or older. The average vital signs were: BP: 138.99 ± 21.77 mmHg, pulse of 92.68 ± 15.45, and a RR of 17.69 ± 4.80. No patient discharged within 24 hours had a prehospital
systolic BP <90 mmHg, 96% of patients sustained blunt trauma. The average ISS was 4.29 ± 3.63. The median GCS was 15 with an interquartile range (IQR) of 1 and the median Revised Trauma Score was 7.84 with an IQR of zero. 21% of patients were self-pay. Finally, families typically drove 71.7 ± 23.52 miles to the trauma center. These patients rarely have a diagnosis of a stroke. Patients transported from the scene are discharged within 2 hours of admission to a trauma center. These patients rarely have a diagnosis of a stroke.

Background:
This study aims to assess the accuracy of prediction instruments in determining large vessel occlusion stroke. This study used innovative miniature, wireless acceleration sensors (ActiPulse Miniature Accelerometer) to determine the stroke risk during prehospital transport. These sensors were used to determine the stroke risk during transport from the scene to the hospital. The study included 58% (95% CI: 45%–76%) of patients being evaluated for stroke between January 2017 and May 2018. If C-STAT scores were not recorded by EMS, they were estimated for 345 patients, and NIHSS scores were recorded or estimated for 324 patients. The primary outcome was the NIHSS score of the patient at hospital arrival. Results: The median NIHSS score was 4 points (IQR: 3–8) for compliant patients and 7 points (IQR: 5–11) for non-compliant patients. The median GCS was 15 with an IQR of 1 and the median Revised Trauma Score was 7.84 with an IQR of zero. 21% of patients were self-pay.

Methods: Three miniature, wireless inertial measurement units (ActiPulse Miniature Accelerometer) were attached to the head, sternum, and stretcher of patients with suspected stroke injuries during ambulance transport (n = 9). Patients were treated according to local guidelines or which allow for either a cervical collar (SMR) or traditional spinal immobilization (SI) with a cervical collar, head blocks, and a long spine board.

Results:
- Average cervical angular motion was low throughout transport (flexion/extension: 1.3 ± 0.3°), axial rotation: 2.4 ± 1.4°, side-flexion: 2.4 ± 0.6°; however the maximal displacements of 17.4 ± 3.9° of F/E, 11.6 ± 2.6° of AR, and 16.6 ± 3.3° of SI were substantially lower than non-compliant patients. The NIHSS score of patients with an identified LVO was compared to those without an LVO (p < 0.05). In calm/compliant patients, F/E (7.2 ± 1.0°), AR (5.8 ± 1.0°) and SI (10.4 ± 3.3°) were substantially lower than non-compliant patients (F/E 22.5 ± 5° compared to SMR 10.7 ± 2.6°, p < 0.05). In calm/compliant patients, F/E (7.2 ± 1.0°), AR (5.8 ± 1.0°) and SI (10.4 ± 3.3°) were substantially lower than non-compliant patients (F/E 22.5 ± 5° compared to SMR 10.7 ± 2.6°, p < 0.05). AR (5.8 ± 1.0°) and SI (10.4 ± 3.3°) were substantially lower than non-compliant patients (F/E 22.2 ± 3.7°, p < 0.05). In calm/compliant patients, F/E (7.2 ± 1.0°), AR (5.8 ± 1.0°) and SI (10.4 ± 3.3°) were substantially lower than non-compliant patients (F/E 22.2 ± 3.7°, p < 0.05).

Conclusions:
This study used innovative technology to provide novel, clinically-relevant data on cerebrovascular trauma patient-induced motions and accelerations. Patient-induced motion may be a greater contributor to cervical spine motion than vehicle-induced motion, independent of immobilization type (p > 0.26). Compliant patients had lower accelerations than non-compliant patients (10.1 ± 2.6 m/s²) (p < 0.05). In calm/compliant patients, F/E (7.2 ± 1.0°), AR (5.8 ± 1.0°) and SI (10.4 ± 3.3°) were substantially lower than non-compliant patients (F/E 22.5 ± 5° compared to SMR 10.7 ± 2.6°, p < 0.05).

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Results:
- 3506 patients met inclusion criteria, 28,738 (80.0%) received fentanyl, 6,534 (18.2%) received morphine, and 634 (1.8%) received ketamine. The median single dose of ketamine was 15 mg, fentanyl 50 mcg, and morphine 4 mg.

Conclusions:
In the prehospital setting, ketamine, compared to fentanyl and morphine, was associated with an equivalent proportion of patients with significant pain reduction. Fentanyl, compared to morphine, was associated with a larger proportion of patients with significant pain reduction. Limitations include inability to calculate weight-based doses and possibility of under-dosing of morphine.

89. PREHOSPITAL USE OF KETAMINE, MORPHINE, OR FENTANYL IN PATIENTS WITH SUSPECTED ACUTE PAIN FOLLOWING TRAUMATIC INJURY

Jeffrey Jarvis, Lauren Curtis, Williamson County EMS Category of Submission: STUDENT, RESIDENT, FELLOW

Background:
Although free-standing emergency department (FSED) services have become commonplace in many communities, they can be inconsistent operationally with respect to relative capabilities. It was hypothesized that a data-driven protocol (algorithm, monitoring system, authorizing FSED-transport) would: 1) improve “ready-for-duty” ambulance availability; and 2) delineate patients who could be safely managed in the more convenient FSED without frequent secondary transfer to traditional facilities. Methods: A “FSED-transport” protocol was designed by EMS and FSED team-memb- ers prior to opening a neighborhood FSED. The protocol was initiated (and closely moni- tored) following a one-year FSED start-up period. Data, including demographics, pre- senting symptoms, discharge diagnoses, dis- position, and follow-up, were collected over the ensuing 12 months of operation (July 1, 2017–June 30, 2018).

Results:
- Among 625 consecutive FSED-
transported patients (mean age 39 years; 55% women; 7% of all EMS transports), common conditions included: “minor injury” (29%), such as lacerations/vehicular collision, “musculoskeletal” complaints (22%), “neurological” symptoms (9%) such as dizzi- ness or headache, and “altered mental sta- tus (AMS)” (9%). Of the 625, 16% (n = 100) were later transferred for hospital-based admission including 42% (n = 25) of AMS patients (4% of the 625 total) and 24% (n = 150) of the neurological cases (2% of the 625) vs. only 9% of minor injury, 6% muscu- loskeletal, and 5% gastrointestinal cases. In follow-up reports, no patients were found to have worsened outcomes or morbidity from delayed care due to secondary transfers, but 3.2% did leave the FSED early (against medical advice) and 2.9% were referred to police and psychiatric facilities. While in-facility turn-around intervals were reduced somewhat (mean 16 min. vs. 18 min.), the total “unavailable for service” period improved substantially, largely because of closer proxi- mity of the FSED (6.49 min. mean transport time) vs. the more distant traditional receiv- ing hospitals (10.35 min, including emergent transport time) vs. the more distant traditional receiv- ing hospitals (10.35 min, including emergent transport time) vs. the more distant traditional receiv- ing hospitals (10.35 min, including emergent transport time). Protocol adjustments (for AMS and significantly improving EMS turnaround rates) were made, resulting in substantially improved EMS turnaround in the FSED-transport protocol setting, with the large- est proportion of volunteers to any currently-working EMS professionals who recertified during the study period were Vermont (n = 380), New York, North Dakota (n = 411/932, 44%). Conclusions: Volunteers comprised over 10% of the EMS workforce in a sample of nationally-certified EMS profes- sionals. More volunteers were EMTs and from rural communities than their paid coun- terparts. Limitations include not assessing the paying occupation of volunteer EMS profes- sionals, for whom spent volunteering in EMS. Future work is needed to understand the regulations and policy implications that promote volunteerism in the EMS profession.

91. CHARACTERISTICS OF VOLUNTEER COMPARED TO PAID EMS PROFESSIONALS IN THE UNITED STATES Rebecca Cash, Madison Rivard, Ashish Panchal, National Registry of EMTs CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS Background: In many areas in the United States, emergency medical response is pro- vided by emergency medical professionals (EMTs) and Fire organizations. However, a minimal amount is known about those who serve as volunteers in EMS, especially as it relates to understanding volunteerism. The objective of this report is to understand the composition of EMS volunteers. Our objective was to compare the characteristics of nationally-certified volunteer and paid EMS professionals in the United States. Methods: This was a cross-sectional evaluation of EMS professionals who recertified their National Registry of EMTs Certification between October 1, 2017 and March 31, 2018. Workforce demographics of the National EMS Certification recertification application were used to determine volunteer status, demographics, and EMS-related characteris- tics. We included currently-working EMS professionals aged 18-85 years. Volunteer was defined as receiving nominal or no compensa- tion for the provision of EMS services at an agency. We compared EMS professio- nals whose main EMS job was a volunteer position with those with a non-volunteer position. Descriptive and comparative statistics were calculated. Results: We received 87,471 responses (response rate = 82%). Of the 81,122 EMS professionals that met inclu- sion criteria (73%) volunteered or non-volunteers in their main EMS job. The median ages (IQR) of volunteers and non-volunteers were 40 (30-52) and 36 years (29-45, p < 0.001), respectively. More volunteers (38%) were female than non-volunteers (25%, p < 0.001). Volunteer characteristics of volunteers compared to non-volunteers were (p < 0.001). Three-quarters (74%) of volunteers reported working in rural (6/250) people) communities as compared to 31% of non-volunteers (p < 0.001). More volunteers than non-volunteers provided primarily 911 response (81% vs. 65%, p < 0.001). The states with the larg- est proportion of volunteers to any currently-working EMS professionals who recertified during the study period were Vermont (n = 380), New York, North Dakota (n = 411/932, 44%). Conclusions: Volunteers comprised over 10% of the EMS workforce in a sample of nationally-certified EMS profes- sionals. More volunteers were EMTs and from rural communities than their paid coun- terparts. Limitations include not assessing the paying occupation of volunteer EMS profes- sionals, for whom spent volunteering in EMS. Future work is needed to understand the regulations and policy implications that promote volunteerism in the EMS profession.

92. ESOMOL USE FOR REFRACTORY VENTRICULAR FIBRILLATION: A PREHOSPITAL CASE SERIES Jeffrey Jarvis, Matt Biasatti, Danny Johns, John Gonzales, Williamson County EMS/ Baylor Scott & White Healthcare CATEGORY OF SUBMISSION: CARDIAC Background: There are few effective inter-ventions for patients with out of hospital cardiac arrest refractory to defibrillation, and CPR. Antidysrhythmics haven’t been shown to be any more effective for ventricu- lar fibrillation (VF) than placebo. There is limited evidence that beta blockade may be effective for these patients. Our suburban EMS system adopted esmolol for use in VF arrest refractory to multiple dual sequence defibrillations, and CPR. Antidysrhythmics haven’t been shown to be any more effective for ventricu- lar fibrillation (VF) than placebo. There is limited evidence that beta blockade may be effective for these patients. Our suburban EMS system adopted esmolol for use in VF rest}.
Background: Intranasal (IN) midazolam is a rapid, painless route of administration to treat status epilepticus (SE). Midazolam may be preferred in the prehospital setting if it is as efficacious as intramuscular (IM), intravenous (IV), and intranasal (IO) administration and if the efficacy of IN midazolam for terminating pediatric seizures in the prehospital setting. We hypothesized that initial IN administration would not increase midazolam redosing compared to the initial IM/IV/IO administration. Methods: This was a retrospective non-inferiority study using data from a regional Emergency Medical Services (EMS) system from January 1, 2010 to December 31, 2017. Pediatric patients ≤14 years treated by EMS with midazolam for non-traumatic seizures were included. The primary outcome was the proportion of patients who required redosing of midazolam in the field after initial treatment with IN midazolam versus IM/IV/IO routes; a risk difference of 5% was set as the non-inferiority margin. The age-adjusted odds of midazolam redosing was also determined. Secondary outcome was the odds of requiring bacterial midazolam administration (BMV). The risk difference with 95% confidence interval for midazolam redosing was calculated and compared with other administration routes. Results: The analysis included 13,612 pediatric patient encounters involving midazolam without documentation of administration route. The median age was 6 (IQR 3–10); 55% were male. Initial administration routes were: 461 (23%) IN, 547 (27%) IM, 1024 (50%) IV, and 2 (0.1%) IO. Midazolam was redosed in 116 patients (25%) treated initially via the IN route vs. 222 (14%) treated initially via the IM/IV/IO routes, risk difference 11% (95% CI: 7–15%). The age-adjusted odds ratio (OR) for redosing midazolam in the field after IN administration compared to IM/IV/IO administration was 2.0 (95% CI: 1.6–2.6). For all routes, redosing most commonly occurred via the same route initially administered. Thirty-one patients (7%) in the IN group received BMV versus 88 (6%) in the IM/IV/IO/IO group; OR 1.3 (95% CI: 0.8–1.9). Conclusions: Prehospital treatment of pediatric seizure with IN midazolam was associated with increased midazolam redosing compared to other administration routes, but no difference in the odds of BMV by EMS.

95. COMPARISON OF COMFORT AND PRESENCE OF SKIN IRRITATION IN NON-INJURED VOLUNTEERS WEARING SEMI-RIGID AND SOFT CERVICAL COLLARS

Michael Hudson, Jason Lin, Christopher Epich, Philipp Hannan, Melissa Hartley, Amber Rice, Joshua Gaither, Classic Air Medical Category of Submission: Trauma

Background: Reducing cervical spine movement using a semi-rigid cervical collar (c-collar) to reduce spinal cord injury has been considered the prehospital standard of care for several years. However, there has been a minimal amount of evidence to support the benefit of the semi-rigid c-collar over other types of c-collars. Some have suggested that the potential risk of semi-rigid c-collar use might outweigh the benefit. In order to better understand this risk, we hypothesize that use of a soft c-collar would improve comfort and reduce skin irritation when compared to a semi-rigid c-collar. Methods: We performed a retrospective review of data collected during an ongoing quality improvement project in which 40 volunteers (paramedics and nurses) were asked to wear either a semi-rigid or a soft c-collar. Volunteers wore a c-collar type for one hour period and rated their comfort on a scale from 1 to 10 (1 being the most comfortable and 10, the least) and describe subjective symptoms, such as skin irritation/breakdown or redness. The primary outcome was comfort and the presence/absence of skin irritation following soft or semi-rigid c-collar use. Paired t-tests were used to compare symptoms after wearing different collar types. Results: Of the 40 volunteers who offered to wear either the semi-rigid or soft c-collar, 22 wore the semi-rigid c-collar for the full study period and 40 wore the soft collar for the full study period. The average comfort level in the semi-rigid group was 4.3 (95%CI: 3.2–5.3) and 3.6 (95%CI: 3.5–3.8) in the soft group (p < 0.0001). In the semi-rigid group 67.5% reported redness at the collar site as compared to 7.5% in the soft collar group (p < 0.0001). Similarly, 45% of the semi-rigid group reported skin irritation symptoms, while only 12.5% of the soft collar group reported the same (p < 0.0001). Conclusions: In this population of healthy volunteers without traumatic injury, wearing a soft c-collar was associated with improved comfort and reduced skin irritation when compared to the same group wearing a semi-rigid c-collar.

96. INITIAL AND MULTIPLE NALOXONE ADMINISTRATIONS IN A MIDWESTERN EMS AGENCY: TRENDS AND CORRELATES

Morgan Anderson, Lori Boland, Jessica Jeruzal, Jonathan Kamrud, Andrew Stevens, Charles Lick, ImageTrend, Inc. Category of Submission: Medical

Background: Prehospital naloxone administrations in the United States are growing rapidly, but regional variability in use is known to exist. The purpose of this work was to examine trends and correlates of naloxone administration in an emergency medical services (EMS) agency, with particular focus on the initial naloxone administration (INA) and multiple naloxone administrations (MNAs). Methods: This work was conducted at a large ambulance service providing coverage in and around the Minneapolis-St. Paul, Minnesota metropolitan area. We retrospectively analyzed all patient encounters involving nalox one administration from 2012–2017. INA was defined as documentation by the prehospital clinician in the electronic patient care record of administration of ≥0.4 mg of naloxone during the encounter. Logistic regression was used to compute the odds ratio for MNA associated with gender, age category, duration of time with EMS, route of INA (intravenous/intranasal (IV/IO), nasal, or intramuscular (IM)) and dosage of INA (≤0.8mg or ≥0.8mg). Results: During the study timeframe, 1,870 patient encounters that involved naloxone were identified, with MNA documented in 604 (32%). The annual proportion of encounters that involved MNA over the seven years from 2012 to 2017 were: 2012, 29%; 2013, 30%; 2014, 40%; 2015, 34%; and 2016, 32%, respectively. Between 2012 and 2017, the proportion of patients who received an INA via IV/IO decreased steadily from 93% to 69%, while the proportion who received an INA nasally increased from 5% to 24%. Male patients demonstrated a greater odds of MNA than female patients (OR = 1.24, 95% CI: 1.02–1.52). After adjustment for gender and duration of time with EMS, increased odds of MNA were also found for patients whose INA was administered nasally (vs. IV/IO; OR = 2.11, 95% CI: 1.65–2.71) and for patients whose INA was <0.8mg (vs. ≥0.8mg; OR = 2.61, 95% CI: 1.95–3.51). Conclusions: In our EMS agency, use of nasal INA increased, while INA via IV/IO decreased from 2012 to 2017. Correlates associated with increased odds of receiving MNAs included male gender, receiving an INA nasally, and an INA dose ≥0.8mg. These results suggest further review of INA dosage amount is warranted.

97. ADENOSINE TRIPHOSPHATE (ATP) BIOLUMINESCENCE SURVEILLANCE OF STANDARDIZED PROTOCOL EFFECTIVENESS ON AMBULANCE CLEANLINESS

Mitchell Butterbaugh, Marshall Waschick, Keith Wesley, Prasanthi Govindarajan, HealthEast Medical Transportation Safety Systems

Background: ATP bioluminescence is a USDA approved method of measuring cleanliness in the food industry and is rapidly being adopted by hospitals. Despite the evidence that ambulances are contaminated with drug resistant organisms, there is little published research or industry standards for ambulance cleanliness. This study addresses this dilemma by quantifying the effectiveness of a standardized protocol using innovative technology. Methods: Study was conducted in a metropolitan ambulance service consisting of 35 ambulances. A total of 5 ALS ambulances were selected at convenience to establish a pre-implementation baseline. A total of 8 locations designated as “high-touch points” were selected for measurement. Surfaces were sampled for the presence of ATP using an ATP bioluminescence monitor and reported as Relative Light Units (RLU). A result of less than 500 RLU defined a surface as clean. Measurements were taken once per month prior to and after the implementation of a cleaning protocol. Results: Initial surveillance demonstrated 20% of “high-touch points” were clean with mean/median RLU results of 2730/1459. One month following protocol implementation 29% of locations were clean with mean/median RLU results of 1445/817. Reduction of mean RLU was significant (p < 0.01). After implementation of a cleaning protocol, 53% of locations were clean with mean/median RLU readings of 1,022/459. Seven months following protocol implementation, mean RLU reduction was 98% compared to both initial baseline and month following implementation (p < 0.01). Of note, the stretcher rail was consistently one
of the least likely locations to be clean. 

Conclusions: In the absence of a standardized cleaning protocol, ATP bioluminescence demonstrates that the majority of "high-touch" points in ambulances fail to meet accepted thresholds for cleanliness. Implementation of standardized ambulance cleaning protocols results in a significant improvement in overall cleanliness.

98. EPIDEMIOLOGY OF PREHOSPITAL PEDIATRIC ASTHMA ENCOUNTERS: DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

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Background: Prehospital care for asthma exacerbations is an integral aspect of respiratory care delivered by prehospital providers. Several studies have explored respiratory rates on the prehospital setting and demonstrated that the majority of patients presenting with respiratory distress are diagnosed with asthma. This study was conducted to describe the demographic and clinical characteristics of the pediatric asthma patients presenting to the emergency department (ED).

Methods: A retrospective observational study of prehospital asthma patients ages 2-18 years from 2011 to 2016 in Florida using EMSTAR Florida's statewide EMS database. Patients were included if they were transported to ED with the chief complaint of asthma. Data were collected including age, sex, race, chief complaints, specialty of care providers, time from call to arrival, and time from arrival to treatment. Data were analyzed using descriptive statistics with chi-squared test for categorical data and t-test for continuous data. Results: A total of 11,226 patients from 2011 to 2016 met inclusion criteria. The median age was 9 years, 60% were male, and 49% were African-American. Only 1,036 (9.2%) patients received methylprednisolone and 12 (<1%) patients received dexamethasone. Patients who received methylprednisolone were older (p < 0.0001) and had longer median transport and time to treatment (p < 0.0001). Time to treatment was shortest in patients who were older, approximately 30-60 minutes for patients aged 2-8 years, and 30 minutes for patients aged 12-18 years. Methylprednisolone use also varied by gender (p = 0.02), but not by race (p = 0.06) or ethnicity (p = 0.16). Notably, there was no difference in treatment time or methylprednisolone use in patients who were transported to ED with acute exacerbation (p = 0.5) or pulse oximetry (p = 0.7), but use did vary by EMS-recorded respiratory effort, level of alertness, and NFILB severity score (both p < 0.001). Adjusted logistic regression revealed the greatest predictors of methylprednisolone administration was IV placement (OR 33, 95% CI: 24-45), magnesium sulfate administration (OR = 5, 95% CI: 3-7), an IM or SQ injection (OR = 3.6, 95% CI: 1.2-10.3), and Atropine administration (OR = 2.4, 95% CI: 2-2.8). Conclusions: This statewide study demonstrates underutilization of prehospital steroids for pediatric asthmatics. This is likely due to protocols only authorizing intravenous methylprednisolone, which in practice reserves steroids for the most severe patients and/or those with long transport times. The efficacy and feasibility of alternative approaches need to be explored.

99. EFFECT OF CRITICAL CARE TRANSPORT ON SHORT-TERM MORTALITY OF CRITICALLY ILL PATIENTS UNDERGOING INTERHOSPITAL TRANSPORT

Tae Han Kim, Kyoung Jun Song, Sang Do Shin, Young Sun Ro, Ki Jeong Hong, Department of Emergency Medicine, Seoul National University Boramae Medical Center CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: To provide the effective treatment and prevent harmful incident during interhospital transport, critical care transport (CCT) unit named “Seoul Mobile Intensive Care Unit (SMICU)” was organized and initiated its operation in January 2013. The study aimed to compare the effect of CCT on hospital outcomes for critically ill patients.

Methods: A retrospective observational study was designed for patients who were transported to hospitals in Seoul during 2016. Main exposure was use of CCT service, which was provided by dedicated emergency medicine physicians and trained emergency nurses/medical technicians using intensive care devices and drugs, vs. non-CCT service, which was provided by non-EMTs physicians or only nurses/EMTs with basic devices and drugs. Primary outcomes were mortality within 24 hours after hospital admission. Data (CCT vs. non-CCT) were identified and sampled with matching process using propensity score collected in the National Emergency Department Information System (NEDIS), to balance covariate between 2 groups. Additional (AORs) with 95% confidence intervals (CIs) by CCT service were calculated using multivariable logistic regression analysis on the outcome, adjusting for potential confounders. Results: Among 42,188 ED patients transported between hospitals in 2016, 482 (1.1%) of patients were transported by CCT service. Mortality of CCT and non-CCT was 4.6% and 6.6% for propensity-matched dataset, respectively. AORs (95%CIs) for 24-hour mortality was 0.25 (0.16-0.45) in cohort and was 0.46 (0.15-0.71) for propensity-matched cohort, respectively. Conclusions: CCT service vs. non-CCT service showed much lower 24-hour hospital mortality in critically ill patients transported between hospitals. Further specific research on the effect of CCT services on outcomes in specific critical conditions is needed.

100. PREHOSPITAL OXYGEN ADMINISTRATION TO SUSPECTED ACUTE MYOCARDIAL INFARCTION PATIENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Jennifer Greene, Michelle Welsford, Craig Ainsworth, Laurie Lambert, Warren Cantor, Graham Wong, Dalhousie University CATEGORY OF SUBMISSION: CARDIAC

Background: Oxygen is commonly administered to prehospital patients presenting with acute myocardial infarction (AMI). We conducted a systematic review to determine if oxygen administration, in AMI, impacts patient outcomes.

Methods: We conducted a systematic search using MeSH terms and keywords in Medline, Embase, Cochrane Database of Systematic Reviews, Cochrane Central, clinicaltrials.gov, and ISRCTN for relevant randomized controlled trials and observational studies on oxygen administration and no oxygen administration. The outcomes of interest were: mortality (<30 days, in-hospital, and intermediate-21 months), life-saving and adverse cardiac events (MACE). Risk of Bias assessments were performed and GRADE methodology was employed to assess quality and overall confidence in the effect estimate. A meta-analysis was performed using RevMan 5 software.

Results: A total of 192 citations of which 48 studies were reviewed as full texts and a total of 8 studies were included in the analysis. All evidence was considered low or very low quality. Five studies reported on mortality finding low quality evidence of no benefit or harm. Low quality evidence demonstrated no benefit or harm from supplemental oxygen administration. Similarly, no benefit or harm was found in MACE or infarct size (very low quality). Normoxia was defined as oxygen saturation measured via pulse oximetry. One recent study and >94% in another. Conclusions: We found low and very low quality evidence that the administration of supplemental oxygen to normoxic patients experiencing AMI, provides no clear harm or benefit for mortality or MACE. The evidence on infarct size was inconsistent and warrants further prospective examination.

101. A COMPARISON OF OUTCOMES FOLLOWING A CHANGE FROM THERAPEUTIC HYPEROXIA TO TARGETED NORMOXEMIA IN PATIENTS SUFFERING OUT-OF-HOSPITAL CARDIAC ARREST

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Background: Patients experiencing out-of-hospital cardiac arrest are complicated with multiple modalities to increase the likelihood of neurologically intact survival. Targeted Temperature Management (TTM) is a widely used cerebral protection therapy, but it remains unclear whether the introduction of hypothermia or maintenance of normothermia is superior. In 2014 our tertiary-care based affiliated hospital overhauled our TTM process and adjusted the standard temperature goal from 33°C to 36°C. We hypothesized that there would be no effect on survival or neurologic outcomes following this change. Methods: We retrospectively compared the rate of TTM utilization, overall survival rate and neurological outcome for patients discharged from the hospital after OHCA. Data was obtained from the Cardiac Arrest Registry to Enhance Survival (CARES) for the post-intervention period (November 2016 – November 2017) compared with a control group prior to the change (January 2012–October 2014). Results: There were 114 patients admitted in the control group and 136 in the post-intervention group. The patient populations were well matched for age (mean 61 vs. 64 years), initial rhythm and other demographic features. There was an increase in bystander CPR (11 vs. 23%), compression only CPR (25 vs. 60%), and ROSC at ED arrival (47 vs. 59%). There was no difference between the rate of TTM utilization (53.5 vs. 54.4%, p = 0.89), overall survival (24.6 vs. 20.3%, p = 0.42), and discharge with favorable cerebral performance score (CPC = 1 or CPC = 2: 35.6 vs. 50.0%, p = 0.57) in patients before or after the new protocol. There was a decrease in the number of patients discharged in coma/vegetative state (CPC = 4: 32 vs. 4%, p = 0.003). There was no difference for good cerebral performance (CPC = 1: 11 vs. 13%, p = 0.62), moderate disability (CPC = 2: 14 vs. 32%, p = 0.28) or severe disability (CPC = 3: 14 vs. 46%, p = 0.062). Conclusions: Change in target temperature following a change from normothermia to targeted hypothermia did not affect survival or favorable neurologic prognosis after OHCA, and less patients were discharged in a coma/vegetative state. Possible

123
102. MANY WAYS TO REFUSE: DESCRIBING VOIDS AND VARIABILITY OF REFUSAL OF CARE IN STATEWIDE TREATMENT PROTOCOLS

Anthony Mahoney-Pacheco, Andrew Pettit, Christina Loporcio, David Schoenfeld, Tufts Medical School

Background: Prehospital refusal of care presents a difficult medico-legal dilemma in balancing patient safety with patient autonomy, resulting in high-risk engagements for patients, prehospital providers, and EMS physicians. Statewide Treatment Protocols (STPs) attempt to reduce risk and improve patient care by standardizing EMS practice; however, prior studies demonstrate considerable variability among STPs. The purpose of this investigation is to describe refusal of care protocols and the variability in their components among STPs. Methods: Cross-sectional study of state standardized review of refusal of care protocols in order to determine variability across multiple characteristics. Characteristics include: establishment of decision making capacity, EMS refusal procedures, and the role of online medical direction. Results: Thirty-six out of 50 states (72%) issue STPs, 25 (69%) of which are mandatory. Of these, 24 (67%) contain refusal of care protocols and 4 (17%) include a protocol to treat and release without a refusal. It is explicitly stated that a patient must understand the risks of refusing care in 18 (75%) of the protocols. Medical decision-making capacity is revoked in patients with altered mental status in 20 (83%) STPs, and with suicidal ideation in 17 (71%). A signature is required in 18 (75%) protocols upon refusal of care. Only 16 (67%) explicitly require EMS to advise the patient to seek further evaluation. Consultation with online medical direction is required for high-risk chief complaints in 10 (42%) STPs. If impairment due to drug or alcohol is suspected, 13 (42%) protocols require medical control consultation. Conclusions: Prehospital refusal of care presents a significant risk to patients and a challenge for EMS providers, both of whom may benefit from the use of standardized protocols. The absence of a specific refusal protocol in 12 of the 36 STPs and lack of direction in determining patient capacity brings to light an alarming void in protocol. This places stress and potential for legal harm on EMS providers and medical direction physicians alike. These results prompt the need for standardization across STPs, identification of other gaps in refusal protocols and investigation into best practices to protect both patients and providers.

103. LINKAGE OF EMERGENCY MEDICAL SERVICES TO HOSPITAL OUTCOMES: A COMPARISON OF TWO APPROACHES

Ian Blanchard, Paul Ronksley, Daniel Lane, Daniel Niven, Hude Quan, Tyler Williamson, Brent Hagel, Stafford Dean, Gennaro Fung, Doig Lang, Alberta Health Services/University of Calgary

Background: Linking Emergency Medical Services (EMS) patients to their health system outcomes is critical to informing paramedic practice. Limited research exists on EMS data linkage, especially reducing selection bias from non-linkage. Patient groups such as trauma and cardiac arrest have higher non-linkage due to missing or incomplete patient identification information. Purpose: To describe the linkage rate and characteristics of unlinked patients using the current strategy employed by an EMS system and an optimized strategy. Methods: A random sample of 4,150 EMS events was created from a fiscal year of data (2016/2017) within a metropolitan centre of 1.2 million people. These patient level data were linked to the National Ambulatory Care Reporting System (a national health information repository), using the current deterministic strategy of a unique provincial health number, hospital and date/time of arrival. Patients not linked using this strategy underwent linkage optimization consisting of deterministic linkage to Sunrise Clinical Manager (a local emergency department repository), using provincial health number, birth, sex, hospital record number, hospital, and date/time of arrival. All linkages were reviewed manually to ensure no false positive links. Results: The current strategy resulted in 3,650 out of 4,150 (88.0%) linked records (95% CI 86.9%, 89.0%). Of the 500 non-linked records, a further 381 were linked using the optimized strategy, which improved the linkage rate by 9.1% (97.1%; 95%CI: 96.6%, 97.6%). There were no instances of false positive linkages in either strategy. The highest proportion of linkage failure with the current strategy occurred in 25 to 34 year olds (n = 93/478, 20%), Echo level events (n = 15/17, 20%), cardiac arrest events (n = 12/46, 26%), and events involving emergency (lights and sirens) transport to hospital (n = 45/231, 20%). The optimized strategy improved linkage in these groups by 64/93(69%), 6/15(40%), 5/6(83%), 5/12(42%), and 5/23(45%) respectively. Conclusions: The current linkage strategy results in exclusion of patients from important subgroups. This selection bias can be reduced by employing the optimized linkage strategy. Selection bias due to linkage should be considered in linked EMS and health system data, particularly among key patient subgroups.

104. IMPACT OF A CHANGE IN STROKE DESTINATION PROTOCOLS

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Background: Accurate prehospital identification of hyperacute stroke allows for transport to an appropriate stroke center. To improve triage of patients with the greatest likelihood to benefit from advanced interventions, a recent change in prehospital stroke protocol redirected all Cincinnati Prehospital Stroke Scale (CPSS) 3/3 strokes to tertiary stroke centers. However, what impact this has had on secondary centers who continue to receive Cincinnati 1/3 and 2/3 patients. Objective: To assess the positive predictive value (PPV) of CPSS 3/3 patients with hyperacute stroke brought to a secondary stroke center before and after the implementation of a change in destination protocol. Methods: A retrospective analysis was conducted of all patients brought to an urban, academic secondary stroke center for a period of 10 months prior and 10 months after the implementation of a change in destination protocol. Patients were identified from 2 separate administrative databases that included all stroke patients brought to the ED. All patients brought to the ED and not transferred from another hospital were included. Prehospital and in-hospital charts were reviewed by a single data extractor. The PPV of the CPSS 3/3 was thrombolyzed at the secondary center, number of transfers for thrombectomy and number of CPSS 3/3s were calculated. Results: In the 10 months prior to protocol, 304 patients were transported to the secondary stroke center, whereas 188 were transported in the 10 months following, a 38% decrease. The PPV in the pre-change was 86.8% and 88% in the post cohort, p = 0.74. Comparing the pre and post cohorts, the proportion thrombolyzed decreased from 21.7% to 16.0% (p = 0.12), transfers for thrombectomy proportionally increased slightly from 5.9% to 6.4% (p = 0.83), and CPSS 3/3s decreased from 39 patients to 17. Conclusions: Following a change in destination protocol, the protocol showed no difference. The implementation of this change to the destination protocol appears to have successfully redirected some patients with more severe strokes to a tertiary stroke center. However, further efforts to identify patients who may benefit from thrombectomy prior to arrival should continue as transfers to a tertiary stroke center were still required.

105. UNRECOGNIZED SEIZURES IN CHILDREN BY PREHOSPITAL PROVIDERS RESULTS IN DELAYED ANTIEPILEPTIC THERAPY

Tiffany Abramson, Emily Rose, Yvette Pearl, Angelica Loza-Gomez, Keck School of Medicine, University of Southern California

Background: Pediatric status epilepticus is the most common pediatric neurologic emergency and a frequent trigger for hospital medical services (EMS) activation. Administering antiepileptic drugs (AEDs) early is paramount to prevent morbidity and mortality. Prior studies suggest 50% of patients do not receive AEDs in the prehospital setting. Pediatric seizures are a high stress and low frequency event for many prehospital providers. This in combination with fear of respiratory depression may explain their hesitancy in administering AEDs. We hypothesize that it may also be due to paramedics’ failure to recognize seizure activity. This study describes paramedic identification of pediatric seizures on arrival to the emergency department and whether there is an association between seizure identification and AED administration. Methods: This is an ongoing prospective, single site, observational study at an urban pediatric emergency department. The study included patients 15 years and younger that arrived by ambulance with a chief complaint of seizure during the 12-month period from May 2017 through April 2018. After patient stabilization, a survey was administered by the emergency physician which included patient’s clinical status, paramedic assessment, and prehospital AED use. The emergency medicine attending’s assessment was considered the gold standard for determining active seizure. Descriptive analysis was performed and is presented in proportions, p-values.
were calculated using the chi-squared test. 

**Results:** There were a total of 288 pediatric sedations. In the study period, 27% were analyzed after 66 were excluded due to incomplete data. The cases were 43% (96) female with an average age of 3.84 years (range 15 days–15 years). Upon arrival at the emergency department, 15.5% (34/222) cases were actively seizing. The paramedics correctly identified 53% (18/34) of the active seizures. We reviewed prehospital AEDs versus only 5% (8/16) of the seizures that were missed by paramedics (p = 0.014). 

**Conclusions:** Paramedics correctly identified 53% of active pediatric seizures. Patients with recognized seizures were significantly more likely to receive prehospital AEDs.

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106. SAFETY AND EFFICACY OF IM MIDAZOLAM FOR AGITATED PATIENTS IN THE PREHOSPITAL ENVIRONMENT  
Lauryn Kosturko, David Eng, Pamela Lai, Douglas Isaacs, Nathan Reisman, Glenn Asaeda, David Prezant, Fire Department City of New York  

**Background:** The severely agitated and vio-  
lent patient in the prehospital setting is a challenge that is dangerous to both EMS providers and patients. Studies have shown that agitated patients are a primary source of injury to patients and providers during ambulance transport. Medications for sedation for managing these patients should be  

given as a single dose with a route of delivery that is safely and easily administered. This study aims to determine the efficacy and safety of single-dose intramuscular midazolam for the sedation of the violently agitated patient in the prehospital setting. 

**Methods:** A retrospective analysis was conducted from May 2016 through February 2017 for severely agitated patients 15 years of age or older who were administered a single dose of Midazolam 10 mg IM in a large urban metropolitan area. Patient care reports and telephone questionnaires with paramedics were reviewed. Adequate sedation was measured by obtaining a RASS score of -1 or less. Adverse outcomes were also measured which included a RASS score of -5, hypotension (SB < 90), hypoxia (SpO2 < 92%), use of BVM, cardiac arrest, advanced airway management and bradycardia. 

**Results:** During the ten month study period, a total of 400 patients were enrolled in which were male and 31% female. Ages ranged from 15 to 99 years of age with a mean age of 38 and mean weight of 82 kg. Of the patients studied, 86.5% were found to have a RASS score of +1 or greater with single dose of Midazolam IM. Overall, only 20 patients (5%) experienced an adverse event including; 7 (2%) had a RASS score of -5, 5 (1.4%) experienced hypotension and 1 (0.3%) required use of BVM. There were 0 cardiac arrests, 0 intubations, and 0 episodes of bradycardia. Of note, all patients were successfully treated with fluid resuscitation. 

**Conclusions:** The administration of Midazolam 10 mg IM was associated with a low incidence of adverse events without any observed infections, persistent hypotension or cardiac arrests. The limitations of this study included its retrospective nature and lack of hospital outcomes.

107. ASSOCIATION BETWEEN SCENE TIME INTERVAL AND NEUROLOGIC OUTCOME FOLLOWING ADULT OUT-OF-HOSPITAL CARDIAC ARREST IN THE UNITED STATES  
Ryan Coute, Brian Nathanson, Michael Kurz, Bryan McNally, Timothy Mader, Universit of Alabama at Birmingham 

**Background:** Our objective was to analyze the association between scene time interval and neurologic outcome following adult non-traumatic EMS-treated out-of-hospital cardiac arrest (OHCA). 

**Methods:** We performed a retrospective analysis of prospectively collected data from the national Cardiac Arrest Registry to Enhance Survival (CARES) database from January 2013 to December 2017. All adult non-traumatic, EMS-treated, bystander-witnessed OHCA with complete data were included. Patients with STI times ≥ 60 min, un witnessed OHCA, nursing home events, and EMS-witnessed OHCA were excluded. The primary outcome was survival with favorable neurologic outcome after approximately 15 minutes, and survival with favorable neurologic outcome following adult non-traumatic EMS-treated out-of-hospital cardiac arrest (OHCA). 

**Results:** There were a total of 57,520 patients who met inclusion criteria with 10,300 (17.9%) surviving with functional recovery. The mean age (SD) was 63.8 (15.8) and 34.4% were female. Mean STI (SD) for survivors with CPC 1 or 2 was 189 (8.4) and 254 (11.8) for survivors with CPC 3 or 4, p < 0.001. For every 1-minute increase in STI, the adjusted odds of a poor outcome (death or CPC 3 or 4) increased by 3.7%; odds ratio: 1.037; 95%CI: 1.029, 1.045), p < 0.001. For every 1-  

**Conclusions:** Longer STI times are strongly associated with poor neurologic outcome in bystander-witnessed OHCA patients. After an STI duration of approximately 15 minutes, the association between scene time interval and neurologic outcome increased more rapidly.

108. FIRST PASS SUCCESS RATES OF OUT-OF-HOSPITAL ADVANCED AIRWAY MANAGEMENT IN ADULTS AND CHILDREN  
Jeffrey Jarvis, David Wampler, Henry Wang, Williamson County EMS, Baylor Scott & White Healthcare 

**Background:** Prehospital advanced airway management (AAM, including endotracheal intubation (ETI) and supraglottic airway insertion (SGA)) of children is difficult. Multiple AAM attempts are associated with increased adverse events. We sought to compare the effectiveness of ETI versus SGA in the hands of adults and children in a national cohort of EMS agencies. 

**Methods:** We used 2017 clinical data from ESO, a national electronic medical record system encompassing over 2,000 EMS agencies. We included all patients receiving any AAM attempts. FPS was similar between adults and children (age ≥ 14 years) and (age <14 years), adjusting for gender, ethnicity, primary impression, and drug facilitation. We repeated the analysis for SGA FPS. We further compared FPS rates between pediatric age subgroups (1, 1–5 years, 6–10 years, 11–14 years). 

**Results:** During the one year period, 731 EMS agencies attempted AAM on 29,369 patients (median 19 per agency [IQR 6, 43]), including 28,846 (98.2%) adults and 523 (1.8%) children. Most AAM were ETI, adults 22,049 (76.4%) and children 471 (90.1%). Most patients were white (65%), males (60%), and witnessed AAM for cardiac arrest (67.3%). ETI FPS was lower in children than adults; 58.6% vs. 72.7% (OR = 0.56, 95%CI: 0.46–0.68, p < 0.001). SGA FPS was similar between children and adults; 84.6% vs. 89.8% (OR = 0.62, 95%CI: 0.30 to 1.43, p = 0.31). Among children, ETI FPS was higher with increasing age; < 1 year 55.7% (42.4–68.5%), 1 to < 6 years 54.8% (48.9–60.7%), 6 to < 10 years 62.7% (48.1–75.9%), 10 to < 14 years 73.5% (61.4–83.5%); p-trend < 0.001. Among children SGA FPS was not associated with increasing age group: < 1 year 80.0% (28.4–90.5%), 1 to < 6 years 95.2% (76.2–99.9%), 6 to < 10 years 72.7% (52.7–89.6%), 10 to < 14 years 84.2% (60.4–96.6%); p-trend 0.44. Conclusions: ETI FPS is lower in children than adults; SGA FPS does not differ between children and adults.

109. STATE OF THE EVIDENCE FOR EMERGENCY MEDICAL SERVICES CARE OF ADULT PATIENTS WITH SEPSIS: AN ANALYSIS OF APPRAISED RESEARCH FROM THE PREHOSPITAL EVIDENCE-BASED PRACTICE (PEP) PROGRAM  
Greene Jennifer, Carter Alix, Goldstein Judah, Jensen Jan, Leroux Yvonne, Swain Janel, Brown Ryan, Lane Daniel, Simpson Matthew, Dalhousie University 

**Background:** The Prehospital Evidence-Based Practice (PEP) program is an online, freely accessible, continuously updated Emergency Medical Services (EMS) evidence repository. This summary describes the research evidence for the identification and management of adult patients with sepsis. 

**Methods:** PubMed was searched in a systematic manner. One author reviewed titles and abstracts for relevance and 2 authors appraised each study selected for inclusion. Primary outcomes were extracted. Trained appraisers scored studies on a 3-point Level of Evidence (LOE) scale (based on study design and quality) and a 3-point Direction of Evidence (DOE) scale (supportive, neutral, or opposing findings based on the studies’ primary outcome for each intervention). LOE and DOE of each intervention were plotted on an evidence matrix (DOE x LOE). 

**Results:** Eighty-eight studies were included for 15 interventions listed in PEP for adult patients with sepsis. As frequently studied interventions were related to identification tools (n = 26, 30%) and early goal directed therapy (EGDT) (n = 21, 24%). Common identification tools included the Sepsis-3 criteria (SOFA) score, quick Sequential Organ Failure Assessment (qSOFA) score. The most common primary outcomes were related to final diagnosis (n = 34, 41%), mortality (n = 40, 45%) and treatment goals (e.g., time to antibiotic (n = 14, 16%). The evidence matrix rankings for the supported interventions were: supportive (n = 1, 7%) for crystalloid infusion, supportive-mod- erate quality (n = 7, 4%) for identification tools, prenotification, point of care lactate,
titrated oxygen, temperature monitoring, and supportive-low quality (α = 1, 7%) for vasopressor. The benefit of prehospital antibiotic and EGDT remain inconclusive with a neutral DOE. There is moderate level evidence opposing the use of high flow oxygen. No current evidence supports the use of hyperbaric oxygen, and prenotification were supported by moderate to high quality evidence, but the optimal identification tool remains under investigation. The availability of portable prehospital use of standard in-hospital therapies such as antibiotics and EGDT. This evidence analysis can guide the implementation of prehospital management by paramedics.

110. PARAMEDIC FIRST PASS SUCCESS RATES IMPROVE WITH VIDEO LARYNGOSCOPY

Michael Berkenbush, Matthew Steenberg, David Feldman, John Allegra, Brian Walsh, Albert Ritter, Atlantic Health -Morristown Medical Emergency Residency CATEGORY OF SUBMISSION: MEDICAL

Background: Video Laryngoscopy (VL) using the "GlideScope Ranger" device was introduced into our prehospital EMS system in late 2010. After a short introductory period our airway standing order protocols were changed to make VL the primary device for intubation. There have been conflicting studies on the benefit of VL for improving first pass success rates. We hypothesized that first pass success rates improved after introduction of VL as a primary device. Methods: Design: Retrospective multihospital cohort of prehospital patients that were intubated by paramedics. Setting: 21 New Jersey suburban and urban ground paramedic units. Population: Patients intubated by paramedics from 1/1/2007 (the year that Rapid Sequence Intubation (RSI) was introduced) to 12/31/ 2016. Protocol: We identified patients intubated using an electronic medical record, and analyzed the first pass intubation attempt. Data collected included the first pass success rates for direct laryngoscopy (DL) from 2007 to 2009, from 2010 to 2016. We a priori chose to compare to the latest 3 years of such programs have not been explored. The aim of this study was to determine the effect of prehospital epinephrine on the neurological outcomes of OHCA. Methods: This study was a cross-sectional study using nationwide OHCA registry in Korea from 2015 to 2016. All EMS-treated adults OHCA with presumed cardiac etiology were included. The primary outcome was good neurological recovery. Potential confounders were demographics, Utstein, and EMS factors. Study population were allocated using propensity-score matching method into epinephrine (EPI) and non-epinephrine (Non-EPI) group. The effect of EPI versus Non-EPI was calculated with adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for the primary outcome using multivariable logistic regression analysis. Interaction analysis was performed to compare the effect of EPI according to cardiac arrest duration (CPA) time interval group. Results: Of total 58,922 patients with OHCA during study period, 37,635 were included in the analysis. There were 3,256 patients (8.7%) who received prehospital epinephrine. By the propensity-score matching method, each 3,259 patients were allocated into each group. Survival to discharge and good neurological recovery were 5.0% and 2.5% in EPI group while 9.4% and 5.9% in Non-EPI group, respectively (all p-values < 0.001). The significant difference in a patient's disposition by exposure status with those call receiving a physiologic response being of a higher acuity nature (α = 18, 5.2% vs., n = 19 1.8%). Time to first medical contact, transport priority, and administration of medications were not statistically different between the groups. Conclusions: In out-of-hospital cardiac arrest, paramedics response to prehospital emergencies was associated with changes in on-scene time and favored response to less frequent call types. These associations may be due to differences in scene management, participation in providing care, and self-dispatching to active calls for service.

111. EFFECTIVENESS AND EFFICIENCY OF AIRWAY CONTROL USING THREE DIFFERENT PROVIDER POSITIOING TECHNIQUES: A MANIKIN STUDY

Warren Doyle, Akash Shah, Jeff Lubin, Peninsula Regional Medical Centers Emergency Medicine Department CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Endotracheal intubation can be a critical skill in prehospital care. EMS providers are often required to intubate patients in difficult positions, including patients supine on the ground. There is little research on how provider positioning impacts success. In this study, we explored 3 different provider positions during intubation via direct laryngoscopy to evaluate which method was most effective. Methods: Ninety-seven percent of providers successfully intubated on the initial attempt in 2 different positions: the provider lying prone at the patient’s head, and the provider anteriorly straddling the patient. In the kneeling position, providers intubated fastest on average (kneeling: 3.85 sec, prone: 4.88 sec, straddling: 5.5 sec) and with the lowest maximum time on first attempt (kneeling: 4.39 sec, prone: 4.90 sec, straddling: 5.16 sec). Neither prone nor kneeling were statistically significantly faster across the 3 attempts (p = 0.228). Prone and kneeling were significantly faster than the straddle position (p = 0.035, respectively). Conclusions: In this manikin study, there was no statistically significant difference in intubation success and speed between prone and kneeling intubation positions over the last year. Sixty-four percent of providers favored the prone position. Ninety-seven percent of providers successfully intubated while kneeling without failure, while only 91% were successful without failure in the prone position. In the kneeling position, providers intubated fastest on average (kneeling: 3.85 sec, prone: 4.88 sec, straddling: 5.5 sec) and with the lowest maximum time on first attempt (kneeling: 4.39 sec, prone: 4.90 sec, straddling: 5.16 sec). Neither prone nor kneeling were statistically significantly faster across the 3 attempts (p = 0.228). Prone and kneeling were significantly faster than the straddle position (p = 0.035, respectively).

112. EFFECT OF PHYSICIAN RESPONSE TO THE SCENE ON EMS SYSTEM PERFORMANCE AND PATIENT CARE

Joshua Loyd, Joshua Loyd, Patricia Dowbiggin, Mary Shockley, Allison Infinger, Doug Swanson, Jonathan Studnek, MEMA, Notant Health CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Many EMS fellowships, a physician response component with varied response models. The structure and impact of such programs have not been explored. The objective of this study was to assess the effect of physician response to the scene of a 9-1-1 EMS call on system performance and patient care. Methods: We performed a retrospective matched cohort study of EMS patient care records in a large urban municipal EMS system. Data from July 1, 2013 to June 30,2017 were collected from computer-aided dispatch data and electronic patient care reports. Exposure was defined as an ambulance response with an EMS physician also on scene. Unexposed responses were identified through review of 9-1-1 calls dispatched during the same month without physician response on scene. Responses were matched based on response priority, call type (dispatch impression), time of day (0600–1800 hrs or1800–0600 hrs), and day of week (weekday or weekend). Each exposure was matched to 3 unexposed calls. On-scene time and response outcomes including refusal, cease resuscitation/pronunciation, other, time to first medical contact, transport priority, and administration of Naloxone, midazolam, or analgesics were assessed for difference between groups. Results: A total of 347 responses with an EMS physician on scene were matched for a total of 1,388 analyzed responses. On-scene time increased in calls with a physician response (mean = 20.8 minutes, 95% CI: 19.4 ±22.2 vs. no physician response mean = 17.5 minutes, 95% CI: 16.1 ±19.1, p < 0.0001). There was a significant difference in a patient’s disposition by exposure status with those call receiving a physician response being of a higher acuity nature (α = 18, 5.2% vs., n = 19 1.8%). Time to first medical contact, transport priority, and administration of medications were not statistically different between the groups. Conclusions: In out-of-hospital cardiac arrest, providers response to prehospital emergencies was associated with changes in on-scene time and favored response to less frequent call types. These associations may be due to differences in scene management, participation in providing care, and self-dispatching to active calls for service.
EPI vs. Non-EPI on outcomes in CPR time interval group 1 (10 min.), group 2 (20–30 min.), group 3 (30 min. or longer) were 0.36 (0.19–0.70), 1.79 (1.21–2.65), 1.99 (1.15–3.47), and 0.14 (0.07–0.29) for good neurological recovery and 1.73 (1.28–2.29), 1.73 (1.22–2.50), and 0.16 (0.10–0.26) for survival to discharge, respectively. Conclusions: Prehospital epinephrine use was associated with worse neurological recovery rates and survival to discharge in propensity-score matched OHCA patients. In the EPI group, more than 10 minutes and less then 30 minutes CPR time interval showed better outcomes.

114. Prehospital First-Pass Success Rates Are Similar Using Video-Assisted versus Direct Laryngoscopy During Cardiac Arrest Calls. But Overall Success Rates Are Higher Using Videoscopes

Katherine Raczek, Craig Cooley, David Miramontes, CJ. Winckler, Joan Polk, JoI Shumaker, Scott Bower, David Wampler, UTHSCSA Category of Submission: Student, Resident, Fellow

Background: Prehospital intubation remains a controversial topic as it poses several unique challenges. Many EMS systems also utilize video laryngoscopy (VL) for intubation. There have been mixed results of studies comparing VL and direct laryngoscopy (DL) for intubation. There have been mixed results of studies comparing VL and direct laryngoscopy (DL) for intubation. The goal of this study was to compare the overall success rates and first-pass success rates of prehospital intubation using DL versus VL during cardiac arrest calls.

Methods: This was a retrospective analysis of prospectively gathered data abstracted from the cardiac arrest database maintained by the Office of the Medical Director from a large urban EMS system. All calls were reviewed from January 2013 to December 2017. Intubation was performed by Paramedics using either DL or VL. Attempts included were all those which were primarily attempted by DL or VL; those that were categorized as a first attempt with an airway adjunct (King LT) or no advanced airway maneuvers were excluded. The primary outcome was the success of all intubation attempts using DL versus VL (primary outcome: first-pass success of attempts. Student t and chi-square tests were used to provide statistical analysis of continuous and categorical variables, respectively.

Results: From the 2013–2017 cardiac arrest database, 5,755 runs qualified as “cardiac arrest.” Of those, intubation using DL or VL on first attempt was tried in 4,408 patients. The rest of the patients either had missing data or the primary attempt was other than endotracheal intubation. DL was the first choice in 4,016 and VL was the first choice in 392, 2,051 (68.6%) were successfully intubated in the primary DL group, with a 74.4% first-pass success rate. Of the VL group, 334 (85.2%) were successfully intubated, with a 79.6% first-pass success rate. The primary outcome of overall success rates is statistically significant (p-value = 0.002). There was no difference between the first-pass groups (p-value = 0.457). Conclusions: In a large urban EMS system where DL is the primary intubation attempt in most cardiac arrest runs, there is no difference between success rates with DL versus VL use during the first pass, however success rates are overall improved when using videoscope assistance.

115. Evaluation of a Patient Selection Tool for EMS Alternate Transport Destinations: First Phase of the Alternative Destination EMV Decision Study (Unpublished)

Timothy Andrew Burns, Christopher Touzeau, Roger Stone, Alan Butsch, Montgomery County (MD) Fire and Rescue Service, EMT Section Category of Submission: Professional

Background: Historically, EMS providers have been presented with one solution to assist a patient’s further healthcare needs; transport to an emergency department (ED). Current guidelines have introduced the concept of EMS agencies transporting patients to alternate transport destinations (ATDs) such as urgent care centers, rather than an ED. It is important to select appropriate patients for these ATDs must be accurate and reliable. Purpose: To validate a screening tool that was developed to assist physicians selecting patients who are appropriate for ATD referral. Hypothesis: A screening tool used by prehospital providers can provide appropriate sensitivity and specificity in identifying patients who are appropriate for ATD referral.

Methods: We found patients that transferred to EDs with identifiers removed. We retrospectively applied the tool’s criteria to assess which patients would have been referred to an ATD. We then obtained de-identified ICD-10 codes, DRGs and ultimate ED disposition for each. A nurse and EMS physician rater each determined which codes were likely versus not manageable in an ATD. The tool was then compared to the physician’s judgment, as well as to the disposition. Results: Of 420 cases, 17 would have been referred to an ATD using only tool criteria. Using a physician standard via the ICD-10 and DRG, the sensitivity of the tool was 61.8% and specificity 59.6%. Using the tool to predict admission, these were 57.52% and 74.07%, respectively. There was a high correlation between MD and RN retrospective review (Phi = 0.77). Conclusions: A screening tool was helpful in selecting patients for transportation to ATDs but appears to need improvement via essential diagnostic criteria to better predict whether an ATD is suitable to provide definitive care for the patient. The human factors of provider judgment or experience and on-line medical direction in certain cases might improve its utility. Limitations: Not all criteria used in the screening tool were available in every case. Future study with improved data reliability and provider involvement would be needed to evaluate improvements in the sensitivity and specificity of the tool.

116. Clinical Outcomes of Out-of-Hospital Cardiac Arrest with Coronary Angiography Without Percutaneous Coronary Intervention: A Nationwide Cross-Sectional Observation Study

Ki Hong Kim, Sang Do Shin, Young Sun Ro, Kyoung Jun Song, Ki Jeong Hong, Joo Jeong, Department of Emergency Medicine, Seoul National University Hospital Category of Submission: Cardiac

Background: Clinical outcomes of out-of-hospital cardiac arrest (OHCA) patients who underwent percutaneous coronary intervention (PCI) has not been studied. This study was conducted to compare the clinical outcomes of OHCA patients underwent CAG with and without PCI. Methods: A nationwide cross-sectional examination study was conducted. Presumed cardiac origin adult OHCA with recovery of spontaneous circulation (ROSC) from January 2010 to December 2017 were included. Patients groups were categorized in 3 groups; No CAG group, CAG with PCI group and CAG without PCI group. Primary outcome was good neurological recovery and secondary outcome was survival to discharge. Multivariate logistic regression analysis was conducted with absolute differences in propensity score matching, interval groups (CAG group): CAG with PCI 4.70 (3.73–5.91) and CAG without PCI 7.16 (5.67–9.05) for survival to discharge, CAG with PCI 1.58 (1.14–2.9) for survival and 1.23 (0.91–1.66) for neurologic outcome. After propensity score matching, additional analysis showed similar results: 1.10 (0.72–1.66) for survival and 0.82 (0.57–1.20) for neurologic outcome. Conclusions: Clinical outcomes of OHCA patients underwent CAG with PCI is no significant difference compared to CAG with PCI group in the observational study. Half of patients who received CAG did not require the PCI. Further study on OHCA who underwent CAG without PCI is needed to define the potential candidate for PCI.

117. Penetrance of Brain Trauma Foundation Guidelines into Prehospital Protocols: 11 Years After Publication

Amanda Lauren Ventura, Dustin LeBlanc, Jason McMullan, University of Cincinnati Category of Submission: Student, Resident, Fellow

Background: The Brain Trauma Foundation’s (BTF) Guidelines for Prehospital Management of Traumatic Brain Injury have not been updated since 2007. In 2017, we found variable penetration in a sample of emergency medical services (EMS) protocols. In this study, we reassess the same sample of protocols for incorporation of BTF guidelines, hypothesizing there will be improved adoption of the BTF guidelines, now, 11 years after publication.

Methods: Our original 61 protocols were purposely sampled from across the United States with a mixture of individual, county, regional, and state jurisdictions; fire-based and third service agencies were included. We re-evaluated current versions of these previously reviewed protocols with the same 23-item tool to capture elements of assessment and treatment of TBI patients as outlined in the BTF guidelines. Chi-square was used to evaluate difference in proportions between 2018 and 2012 protocols. Results: Current versions were available
for 53/61 protocols, original protocols that did not have an updated counterpart were excluded from analysis. Updated protocols demonstrated that there is still a significant deficit in the adoption of the evidence based BTF guidelines. While 16/23 (70%) BTF guidelines were evaluated showed increased uptake between 2012 and 2018, only 8/23 (35%) appear in more than half of protocols. Significant increases were seen in assessments of hypoxemia (87% vs. 100%), Glasgow Coma Scale after resuscitation (4% vs. 23%) and before paralytics (0% vs. 21%), orbital trauma (17% vs. 34%), and herniation (19% vs. 27%). However, 83% of the detections of asymmetric (1/53) or fixed pupils (0/53) are rare and only 6/53 prescribe hyperventilation for signs of clinical herniation. Conclusions: Brain Trauma Foundation guideline recommendations for prehospital care remain under-represented in a broad sample of EMS protocols, with some improvements made for individual items. Several key issues, including detection and treatment of herniation, still need widely increased adoption.

118. EFFECTS OF A NEW DISASTER TRAINING CURRICULUM ON ORGANIZATION CAMPUSS ON SELF-ASSESSMENT OF DISASTER COMPETENCY

J. Marc Liu, Anthony NuvalMD, Medical College of Wisconsin CATEGORY OF SUBMISSION: DISASTER

Background: Healthcare disaster preparedness is attracting renewed attention with the increased number of incidents. Recently, a unique program was designed to teach a new campus-wide coordination plan and basic emergency management principles. This new emergency coordination plan integrates the incident response in one of the few campuses containing multiple healthcare organizations coexisting in the same geographic space. This 5-session program over 4 months included didactic lectures and experiential education (role-playing scenarios). This study examined the effect this newly created disaster preparedness training program would have on participants' comfort level with key competencies in disasters. Methods: Subjects were voluntarily recruited from program participants. Participants were mailed a survey of various disciplines from 6 separate healthcare organizations. The survey instrument contained 10 questions, each covering one of 10 previously described disaster preparedness core competencies. Participants' self-assessed comfort in each competency area by rating their ability on a 5-point Likert scale before and after attending the program. Mean scores on each question pre- versus post-training were compared. Results: Statistically significant improvements were noted in 9 of 10 core competencies. The largest self-reported confidence to effectively communicate (mean 3.67 pre, 4.20 post, p < 0.006), identify resources (3.62, 4.12, p < 0.039), consider ethical challenges (3.60, 4.20, p < 0.003), and understand legal issues (3.31, 3.96, p = 0.010) in disasters. No significant changes were seen in the mean scores for resource areas. Conclusions: This novel disaster preparedness training program resulted in an increase in participants' confidence in their ability in some, but not all, of the 10 previously described core competencies. Further research is needed analyzing what factors influence comfort level in each area, as well as correlation with actual performance. Such research will better prepare the healthcare sector for future disasters.

119. ANALYSIS OF THE INCIDENCE AND OUTCOMES OF TRAUMATIC PNEUMOTHORAX ON THE CONTEMPORARY BATTLEFIELD

Robert Gerhardt, Luke Porsi, Department of Emergency Medicine, UT Health - San Antonio CATEGORY OF SUBMISSION: TRAUMA

Background: Traumatic pneumothorax (PTx) and tension pneumothorax (TPTx) are proximate causes of death in the battle field. This study examined the incidence, severity, and mortality of PTx-associated deaths. Objective: Analyze U.S. combat casualty records from the U.S. Department of Defense Trauma Registry, focusing on PTx epidemiology, interventions and outcomes. Methods: Retrospective cohort of casualties with AIS code 442024 (PTx) or ICD9 code 860 (PTx and subtypes), from September 2007 through June 2011. We abstracted injury mechanism, demographics, 30-day outcome, out-of-hospital needle decompression and chest tube thoracostomy histories (if performed). ICD9 codes 860.2 and 860.3 (isolated or openemothorax) were excluded. Our IRB reviewed and exempted this study. Results: A total of 8,124,439 casualties, of which, 2,969 (0.035%) had PTx (4%), with 11 progressing to TPTx (3% of PTx); 335 survived (95%). The combined case fatality rate was 5%. 201 cases were associated with a blast-injury mechanism (57%). Among TPTx cases, 8 survived (73%). Of TPTx survivors, 2 received needle decompression (25%). Of the 327 patients who survived simple PTx, 41 underwent prehospital needle decompression (13%) and 15 received a chest tube (5%). Of the 18 TPTx-associated deaths, 3 had TPTx (17%); none had documented decompression. Of the remaining 15 TPTx-associated deaths, 2 had evidence of needle decompression (13%). For PTx, OR for death was reduced to zero (CHR 0 to 17) with chest decompression. Review of all cases for ICD Code 512.1 (iatrogenic pneumothorax) resulted in no cases with this diagnosis. Conclusions: PTx remains ubiquitous on the contemporary battlefield, but contrary to expectation, does not contribute to morbidity and mortality if untreated. In this sample, out-of-hospital chest decompression of PTx was associated with improved survival. Needle decompression, rather than trigger focused chest exams, closer observation, and more aggressive management of suspected TPTx.

120. INFLUENCE OF A ZOMBIE APOCALYPSE SCENARIO ON INTEREST IN DISASTER PREPAREDNESS TRAINING

Jeffrey Luk, Tyler Haas, Amy Pound, University Hospitals Cleveland Medical Center/CWRU School of Medicine CATEGORY OF SUBMISSION: DISASTER

Background: Disaster drills (DDs) are critical to ensuring preparedness. Organizations have utilized zombies to disperse DM education and interest. This study evaluates whether personnel in a single ED from June 2016 to May 2017 would attend a zombie apocalypse-themed DM drill. Methods: Personnel were given a self-report survey to complete it once. Responses were anonymous. Participation was voluntary. The IRB deemed this study as quality improvement. Results: A total of 105 individuals responded (46.7% of those that had participated, 89.5% of them who had attended DM drills while 55 (52.4%) had not). Of those that had participated, 89.5% of them enjoyed it and/or found it educational. On a Likert scale of 1 (not interested) to 10 (very interested), 74.7% selected a score of ≥6 for participating in a DM drill. A desire to be prepared and acknowledging that disaster preparedness is an important skill to know were the top 2 reasons for interest. However, 60% had a comfort level of <5 with DM on a Likert scale of 1 (not comfortable) to 10 (completely comfortable). The primary reason for not being interested in DM training was being too busy. The majority of respondents (42, 41.6%) selected a zombie apocalypse as the DD they would least likely attend. The same number of respondents selected a generalized DM simulation or classroom event as the type of DD they would most likely attend. The primary reason given was how likely the event would occur. No clear preference existed for time of day; length of training; personnel attending; host; presence of food/personal home-school; or cost. Conclusions: We found that a zombie apocalypse-themed DD would not increase interest in attending. Personnel were much more interested in a realistic DD. While a strong interest in DM training existed, comfort for DM needs to be improved. Time needs to be dedicated and protected for DM training. Further research should specify interventions to overcome these obstacles so that disaster preparation is improved.

121. EVALUATION OF A NOVEL PROTOCOL FOR PREHOSPITAL IDENTIFICATION AND MANAGEMENT OF PEDIATRIC SEPSIS

Nicolas Wyhs, Karen Keller Baker, Jennifer Anderson, Bel Air Volunteer Fire Dept, Harford County, Maryland CATEGORY OF SUBMISSION: PEDIATRIC

Background: Identification and management of sepsis in the prehospital arena can be challenging, particularly for pediatric patients. In June 2016 Maryland introduced a state-wide protocol to assist prehospital providers with identification and treatment of pediatric patients suffering from sepsis. The protocol combines an age modified SIRS criteria along with a physical exam finding to trigger hypoperfusion. With the expectation that the protocol should achieve moderate specificity, it groups patients into 2 categories. The first identifies patients with moderate risk of sepsis, and directs supportive care and prearrival alert to receiving hospitals. The second category identifies patients in septic shock and directs additional treatment including fluid boluses and vasopressors. Objective: To evaluate the accuracy with which providers apply a new protocol to classify potentially septic children. Methods: We performed a retrospective review of pediatric sepsis patients transported by Maryland EMS over the first 24 months of the new protocol. Cases were included for review if the prehospital record had either a primary or secondary impression of sepsis in the prehospital report or documentation of a “sepsis alert” to the receiving hospital. Cases were excluded if detailed review indicated that the sepsis labels had been chosen in error. From the prehospital record, we collected data including demographics, vital signs, high risk factors, and EMS provider impressions. Results: 78 emergency (9-1-1) calls were identified over the study period, 60 of which
were high priority. Of those, 37 (62%) were accurately classified under the sepsis protocol, 24 were classified as potential, large vessel occlusions (LVOs) to an endovascular-capable stroke center when such transport does not preclude timely alteplase (tPA) administration. The purpose of this study was to determine the extent to which EMS providers implement these recommendations.

Methods: We conducted a national cross-sectional survey of EMS providers affiliated with American Medical Response (AMR). AMR provides prehospital care in 38 states and is responsible for approximately 20% of EMS care in the United States. Subjects were recruited over a 3-month period in 2018 via an email-linked REDCap survey distributed by regional clinical leaders. The survey instrument was developed using an iterative process and was pilot tested by content experts and EMS providers. Survey questions assessed EMS practices with regards to: identification of potential and embolomomy candidates; tools employed to assess stroke severity; and indications and ability to bypass a primary stroke center for an endovascular-capable stroke center. Descriptive statistics were used to quantify responses.

Results: A total of 255 EMS providers from 15 different states completed the survey. The study population was 67.6% male, 91.8% Caucasian, with a mean age of 36 years. On average, subjects had 7.2 years of basic life support (BLS) experience and 8.8 years of advanced life support (ALS) experience. Approximately half of respondents (52%) indicated they further assess for stroke severity and possible LVO when evaluating a suspected stroke patient. The most common reason for not screening was a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions: While limited by a convenience sample, these data demonstrate a lack of formal training or protocols to do so (67%). Of those screening for LVO, only 50% used a formal stroke severity scale, usually the Cincinnati Prehospital Stroke Severity Scale (35%). The majority, 66%, reported stroke severity influencing destination selection. Conclusions:

123. DO PATIENTS GIVEN NALOXONE ACTUALLY HAVE OPIOID TOXIDROMES? 
Brian William Walsh, Daniel Johnson, Ryan Guzik, David Feldman, Morristown Medical Center Category of Submission: Medical 

Background: Naloxone is administered frequently for the reversal of presumed opioid toxidromes, resulting in hyperventilation. A recent ACPNow publication warns of the possible anchoring bias by emergency department providers resulting from naloxone given prehospital. The purpose of this study was to determine the ultimate diagnoses of patients treated with prehospital naloxone with attention to the physiologic toxidrome. Methods: Setting: A large, suburban, 2-tiered EMS system with approximately 25,000 Advanced Life Support (ALS) requests per year. Design: Retrospective cohort study. Population: Consecutive patients treated prehospital by ALS providers with naloxone over a 60-month period. Appropriate patients for naloxone were defined as patients with a CCR <14, without contraindicating (initial respiratory rate (RR)<10 or a pulse oximetry <92%). A positive response was defined as an increase of 4 or more breaths per minute or a change of at least 10% with naloxone administration. The disposition diagnoses were determined from the hospital’s medical record. These diagnoses were classified into 3 predetermined categories including opioid overdose, mixed overdose, and non-toxicological diagnoses. Results: The median age of the patients was 52 (IQ Range [34–68]); 62 (36.6%) patients were female. Overall, 400 (24.6%) patients received naloxone by ALS. Of these, 38 (22.4%) were diagnosed with primary opioid overdose, 36 (21.3%) with mixed overdose, and 95 (56.2%) with other non-toxicological diagnoses. Compared to non-responders, those with a positive response to treatment were diagnosed more frequently with primary opioid overdoses (46%, vs. 13%, p<0.001). As expected, non-responders had a higher likelihood of non-toxicological diagnoses than did those that had a positive response (69% vs. 26%, p<0.001). Surprisingly, there were a significant number of responders who had non-toxicological diagnoses. Conclusions: Of the patients administered naloxone prehospital, 28% of 250 did not receive an opioid overdose. While primary opioid overdose was more frequent in those with a positive response to treatment, a significant number of positive responders with non-opioid related diagnoses were also found. It is prudent to maintain a broad differential diagnosis for patients with encephalopathy and a presumed opioid toxidrome, independent of their response to naloxone. 

124. TRANSITION FROM MILITARY PREHOSPITAL MEDICINE TO CIVILIAN EMS 
Sally Westcott, Benjamin Walrath, Melissa Trumbull, Craig Manifold, Naval Medical Center San Diego Category of Submission: Student, Resident, Fellow 

Background: Nearly 10,000 veterans with medical experience transition to civilian work force each year. A current manpower shortfall exists in civilian emergency medical services (EMS) systems, with some estimating a need for 12,000 more EMTs and paramedics annually. We sought to identify the percent of military medics who obtained civilian prehospital certification and possible reasons for those who did not receive civilian EMS certification. Methods: The National Association of EMTs (NAEMT) created a 2021 questionnaire that was made available online to any willing participant. Participants were solicited through the NAEMT website, personal connections and social media. All survey responses remained anonymous and no identifiable information was collected. Survey questions were compiled and are reported here as percentage of respondents. Upon completion of survey administration, the results will be analyzed with a logistic regression model to determine relationship of military characteristics to likelihood of certification, and intent to transition to civilian EMS. Results: Preliminary data results include 423 military medics respondents, 284 (71%) had prehospital experience and 245 (58%) had Emergency Department (ED) experience while in the military. Over 36% of respondents had 18+ months of ED or combat related duty. Civilian prehospital certification was obtained by 360 respondents, 155 (37%) EMT, and 154 (37%) paramedic. However, 114 (28%) of respondents say they will not work in civilian EMS. Top selected reasons for not pursuing civilian EMS careers include pursuing a medical career that was not prehospital (27%), pay disparity (19%), and the desire to remain in uniform (16%). The conditions that were more likely to mitigate this trend were having completed or planned basic life support (BLS) training. Future studies are needed to fully understand the barriers to implementation of the Mission Lifeline guidelines.
operating in NMW, of which 58% were BLS units, 5% were Intermediate level (ILS) units, and 37% were ALS units. These were operated by 857 prehospital providers, of which 89% were NR-EMT, 4% NR-AEMT, and 7% NR-Paramedics. Of the 4,327 recorded runs, 845 (20%) were non-transports. The accuracy of the transports was 30% ALS and 70% BLS. Critical indications for EMS transport included 34 (0.8%) out of hospital cardiac arrests and 790 (18%) transport for trauma injuries (10%) cerebrovascular accidents. Local medical directors conducted quality assurance review of 24% of patient care records. These results reflect a limited data set based on the 46% of monthly reports currently submitted.

Conclusions: In this limited data set, the NMW EMS system deliveredprehospital care to 4,327 patients in 2017, including 868 (20%) patients suffering from time-sensitive conditions. Quality assurance review was completed for less than 25% of runs and may present an opportunity for process improvement. Further investigation is needed to determine the most common types of calls and how to best allocate resources to optimize prehospital care throughout NMW.

126. PARAMEDIC-OPERATED PREHOSPITAL POINT OF CARE ULTRASONOGRAPHY IN PATIENTS WITH UNDIFFERENTIATED DYSPEPSIA: A PILOT STUDY
Jacob Schooneck, Ryan Coughlin, David Cone, Kevin Burns, Daniel Joseph, Ian Menon, Christian Balos, Nancy G. Cone, Amanda Medoro, Rachel Liu, Christopher Moore, Yale New Haven CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOWS

Background: Thoracic ultrasound is frequently used in the emergency department (ED) to evaluate patients with shortness of breath, but prehospital use is not widespread. Systematic studies are needed to assess the ability of non-physician EMS personnel to adequately obtain and accurately interpret thoracic ultrasonography in patients with undifferentiated pathology. Methods: A protocol for prehospital providers was developed and the providers were assessed by the paramedics to identify B-lines, lung sliding, pleural effusions, and pericardial effusions using a pocket ultrasonic unit. Providers who performed didactic instruction and completed a 90-minute didactic session followed by hands-on training in the ED. Adult prehospital patients with shortness of breath showing signs or symptoms of respiratory distress were eligible for inclusion. Paramedics recorded their findings and their most likely pre-and post-ultrasound diagnoses. Repeated point-of-care ultrasound were performed by trained physicians upon arrival to the ED. All clips were reviewed by a point-of-care ultrasound expert. Statistical analysis was performed using the Wilcoxon signed-rank test. Results: Sixty-three paramedics completed both the didactic and hands-on training; 22 performed prehospital ultrasound. Forty-five patients received ED ultrasound. There was no significant difference in the paramedic and physician interpretations for significant B-lines (p = 1.0). Lung sliding (p = 0.06), or pericardial effusion (p = 0.33), but interpretation for pleural effusion was significantly different (p = 0.01). There was a positive Spearman correlation between the findings of significant B-lines and a change in the paramedic’s pre-ultrasound diagnosis of “COPD/Asthma” to the post-ultrasound diagnosis of “CHF” (R = 0.2824).

127. DESCRIBING PREHOSPITAL DELIVERIES IN MICHIGAN
David Eisenbrey, Robert Dunne, Kris Torossian, William Fales, Robert Swor, Beaumont Health System, Department of Emergency Medicine CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOWS

Background: We observed clinically that prehospital deliveries last observed to have a high rate of complications. There is scant literature that addresses prehospital deliveries across a state. Objectives: This study’s objectives were to describe utilization, complications, and short term outcome of EMS attended prehospital deliveries in Michigan in 2015 and to describe the relationship between prehospital delivery and socioeconomic status (SES). Methods: We queried the Michigan EMS Information System (MI-EMS) for prehospital deliveries. We identified candidate cases, using a combination of narrative, demographic and procedural search strategies. Cases were included if birth was prior to hospital arrival. We abstracted demographics, birth circumstances, complications, and birth outcome. Duplicate reviews of 20% of cases were performed to assure interrater reliability. Categories of complications were stratified by injury, delivery mode, and strength of evidence that patella reduction can be performed by EMS providers with infrequent evidence that patella reduction can be performed. A pilot study of 81% for significant B-lines. This pilot study suggests that paramedic interpretation of prehospital thoracic ultrasound assessing for significant B-lines is comparable to that of ultrasound performed by physicians in the ED. Coronal lung views for pleural effusion may be more challenging for paramedics to interpret. Discovery of pathologic ultrasound findings can change paramedic diagnostic decision-making. Further work is needed to determine any effect on patient-centered outcomes.

128. IMPLEMENTATION OF A PREHOSPITAL PATELLA DISLOCATION RELOCATION PROTOCOL
Jeremy Cushman, Spencer Lord, James Bendell, Heather Lenthall, and Brian Dailies
Christopher Fullagar, Division of Prehospital Medicine, University of Rochester CATEGORY OF SUBMISSION: TRAUMA

Background: Acute patella dislocations account for up to 3% of all knee injuries. Prehospital care of patellar dislocations includes knee immobilization and pain management, but patella reductions are often performed in the wilderness environment by basic life support providers. Given the potential benefits of early reduction, the perceived low risk of harm and ease with which the procedure can be performed, patella reduction was added to the EMT scope of practice in New York State. To our knowledge, there are no studies reporting the RESULTS of prehospital personnel performing patella reductions. Our objective was to characterize the mechanism of patella related injuries and describe the success rate, complications, and EMS provider experience with a prehospital patella relocation protocol. Methods: This was a retrospective review of a pre-existing quality assurance database. EMS providers who attempted patella reduction between October 1, 2016 to June 30, 2018 were asked to complete a survey at the time of care documentation. Data was collected using Research Electronic Data Capture (REDCap, Vanderbilt University) and included mechanism of injury, reduction attempt result, pre-and post-reduction pain scores, observed complications, and transport decision. Results: Fifty-one patients underwent an attempt at patella reduction at one of 34 EMS agencies during the study period. 47/51 (92%) were successfully reduced. Mean age was 21.4 + /− 13.8 years (Range 8-88).Mechanism of injury included sports injuries (35, 68%), falls (8, 16%), twist and fall (2, 4%), non-sport contact (2, 4%), motor vehicle accident (1, 2%), and unknown (3, 5%). Median initial pain score was 8.2; final pain score was 2.7; 12/51 (24%) had pain medication prior to transport; 11/51 (22%) after reduction. Eight (16%) declined transport to the hospital. There were no reports of complications during or after reduction. Two of the 4 untreated patients were due to pain. Conclusions: While a convenient sample, our results provide preliminary evidence that patella reduction can be performed by EMS providers with infrequent complication and offer significant pain relief.

129. CHARACTERISTICS OF EMS TRANSPORT REFUSAL FOLLOWING GLUCOSE OR NALOXONE ADMINISTRATION
Jeffrey Jarvi, David Phillips, Remie Crowe, Williamson County EMS, Williamson County Healthcare CATEGORY OF SUBMISSION: MEDICAL

Background: EMS responses resulting in transport refusal are of interest due to clinical outcome, liability and financial risks. Treat and release protocols are being increasingly developed for hypoglycemia and opioid overdose. Scott et al. (2016) comparing the characteristics of refusals between patients given naloxone, glucose, or neither drug. Objective: We sought to describe the characteristics of transport refusal among patients who received glucose, naloxone, or neither medication. Methods: Using 2017 ESO Solutions electronic patient
care record (ePCC) data, we performed a retrospective analysis of all 9-1-1 responses with 9-1-1 operators reporting cardiac arrest as transport refusal. Patients were classified as having received naloxone, glucose, or neither. Multivariable logistic regression was used to control for covariates, including response characteristics (time of day, day of week), agency characteristics (type, volunteer status), and patient characteristics (age, gender, race/ethnicity). Adjusted odds ratios and 95% confidence intervals are reported (aOR, 95%CI). Results: We excluded 1,219 patients who received naloxone and glucose, leaving 39,766 (14%) of all responses resulted in transport refusal. 2,838 (7%) of those given naloxone refused, 16,548 (39%) given glucose refused, and 38,308 (14%) given neither drug refused (p < 0.001). Of patients given naloxone, 10% were male, compared to 53% given glucose and 46% given neither (p < 0.001).

More patients receiving naloxone were white, non-Hispanic (80%) compared to those given glucose (67%), or neither (71%) (p < 0.001). About half (47%) of those given naloxone were 65 years and older, compared to 20% of those given glucose and 22% of those given neither. After controlling for patient, agency, and response characteristics, odds of non-transport for patients given glucose and naloxone were 4.1 (95%CI: 1.8-9.7) and odds of non-transport for patients given glucose alone were 3.0 (95%CI: 1.7-5.0) compared to those given glucose.odds of transport refusal were 54% lower (aOR: 0.48) compared to patients given neither.

Background: Prior publications have high-lighted differences between out-of-hospital cardiac arrest (OHCA) in Detroit below 1% a decade ago. Due to a resurgence in the city and improvements in public services, we hypothesized that the survival rate of OHCA patients in Detroit has improved and is asso-ciated with an increasing trend in bystander cardiopulmonary resuscitation (CPR).

Methods: A retrospective, observational review of all non-traumatic OHCA responded to by Emergency Medical Service (EMS) was performed across Wayne, Oakland, and Macomb counties from 2015 through 2017. Data was abstracted from the Cardiac Arrest Registry to Enhance Survival (CARES registry). Those cases without run sheets or medical records were excluded. We defined good neurological outcome as cerebral performance scores of 1 or 2. We identifed all OHCA that occurred in Detroit and used all OHCA that occurred within the region. We calculated the annual incidence and compared. We used univariate statistics to compare frequencies and test of trend over the 3-year period. Results: Analysis included 10,796 OHCA, of which 3,132 occurred in Detroit from 2015 to 2017. bination of OHCA in Detroit were overall younger (61.7 vs. 66.3 years, p < 0.001), more frequently female (44.5% vs. 39.6%, p < 0.001), and more frequently presented with a non-shockable rhythm (85.8% vs. 81.6%, p < 0.001).

While rates of layperson bystander CPR remained unchanged in the suburban region (35.8% to 35.1%, p = 0.56), there was a significant increase in Detroit (27.4% to 35.6%, p < 0.001). Detroit also had a substantial increase in first responder-initiated CPR (10.0% to 22.8%, p < 0.001). Rates of shockable rhythms increased in Detroit from 12.9% to 15.1%, though this trend did not reach statistical significance (p = 0.079). Whereas survival to hospital discharge increased from 8.2% to 12.6% in the suburban region, Detroit saw a significant increase in survival (5.3% to 7.3%, p = 0.026).

Conclusions: In Detroit, OHCA survival has significantly improved alongside improvements in bystander and first-responder CPR between 2015 and 2017.

131. CARDIOVASCULAR EVENTS AFTER THE SEWOL FERRY DISASTER

Sooyeon Joyce Kong, Kyoung Jun Song, Sang Do Shin, Young Sun Ro, Seoul National University Hospital Category of Submission: Cardiac

Background: The Sewol ferry disaster, which occurred on April 16, 2014 in Korea and resulted in about 400 deaths or lost, was a terrible event. Most people experienced serious physical and mental stress due to the live TV news repetitively reported the rescue failures of the passengers on the immersed ferry. After 3 weeks, the president announced the formal decision to abandon rescue activity. We hypothesize that such a traumatic national disaster might be a trigger strong enough to cause an increase in the incidence of emergency cardiovascular events.

Methods: Using the National Emergency Department Information System (NEDIS) covering approximately 130 hospital emergency departments, we extracted all adult patients (<18 years) who visited emergency departments from March 15 to June 17 in each year from 2011-2014 (from 4 weeks before to 8 weeks after April 16) and were diagnosed with cardiovascular events (acute myocardial infarction, angina, and cardiac arrhythmias) coded with the International Classification of Diseases, 9th revision (ICD-9). Poisson regression models were used to calculate the incidence rate ratios (IRRs) comparing the weekly changes in the occurrences of cardio-vascular events from the week of Sewol (April 16-22) to 5 weeks after the Sewol (June 11-17), adjusting for calendar years (years 2011-2014) and environmental factors.

Results: During the study periods, cardiovascular events were assessed in 73,823 patients. When the cardiovascular incidents of each week through the 8 weeks after Sewol were compared with the control period, the Sewol (April 16-22) and 5 weeks after the disaster showed significant increase in the cardiovascular emergencies; 1.09 (95%CI: 1.03-1.15) and 1.08 (95%CI: 1.02-1.15), respectively (p < 0.01 for both). In particular, there was 21% increase in incidence of arrhythmia (IRR = 1.21; 95% CI = 1.02-1.44, p < 0.001).

Conclusions: We found a significant increase in the incidence of cardiovascular events during the week of event and on the 3 weeks after the Sewol ferry disaster in 2014. These additional cardiac emergencies may have been triggered by emotional stress in relation to the tragic catastrophe, suggesting the importance of considering the potential public health impact on the society as a whole, including those with indirect exposure to tragic catastrophe.

132. ALCOHOL USE, SUBSTANCE USE, AND MENTAL HEALTH IN PARAMEDIC

Elizabeth Donnelly, Renee MacPhee, Steven Fischer, Dwayne Barris, University of Windsor Category of Submission: Operations, Quality, Safety Systems

Background: The amount of empirical research that has investigated alcohol and substance use among Canadian paramedics, to describe their reported reasons for use, and to ascertain if a relationship exists between alcohol and substance use and levels of depression, anxiety, and stress. Our hypothesi-sis was that alcohol and substance use would be prevalent, and significantly related to levels of stress, anxiety, and depression.

Methods: Through the national Canadian Paramedic Health & Wellness survey, paramedics were asked if they consumed alcohol or controlled substances, and to identify their reasons for use. Levels of depression, anxiety, and stress were measured using the DASS-21. Analyses were conducted using descriptive statistics and independent samples t-tests. Results: Based on 2,557 completed surveys, 80.8% had consumed alcohol and 8.2% used controlled substances. The average number of drinks consumed in a week was M = 5.97 (SD = 6.97). Ninety-six percent reported that alcohol was for recreational purposes, 41% reported it was for pain control, and 5.7% cited “other” reasons, with the most frequent other reason was mental health concerns (42.4%, n = 50). Respondents who reported using alcohol for mental health concerns had significantly higher levels of stress, depression, and anxiety (p < 0.001). Respondents who had mild to severe levels of depression, anxiety, and stress drank more alcohol than those who did not have mental health concerns (p < 0.001). Respondents who reported using controlled substances for mental health concerns was for recreational use, 34.8% for pain control, and 34.8% for other reasons. The most frequent other reason was mental health concerns (42%, n = 32). Respondents who reported using controlled substances for mental health reasons had significantly higher levels of stress, depression, and anxiety (p < 0.001).

Conclusions: These results indicate that paramedics do consume alcohol and controlled substances, and for some, that use is related to their mental health. The signifi-cant relationship between alcohol use and controlled substance use, and mental health indicates that there is a need for holistic serv-ices that address both concerns for paramedics.

133. PUBLIC PERCEPTION TOWARD THE DECISION TO PERFORM Bystander CARDIOPULMONARY RESUSCITATION

Torben Becker, Sarah Gul, Scott Cohen, Carolina Maciel, Travis Murphy, Teddy Young, Emotion, Adrian Tyndall, Carlos Alvizar, University of Florida Category of Submission: Cardiac

Background: Bystander cardiopulmonary resuscitation (CPR) after out-of-hospital cardiac arrest (OHCA) improves survival and neurological outcomes. Unfortunately, many
OHCA victims do not receive bystander CPR during a witnessed arrest. It is known that gender affects performing CPR with lower rates of bystander CPR in women suffering OHCA in public places. Our aim was to identify potential factors influencing the decision to perform CPR. Methods: Participants at CPR training events were surveyed prior to training. Using different scenarios, subjects were asked about their comfort level performing CPR on female, geriatric, and pediatric victims. Anonymous responses were collected and transformed into categorical variables by a psychometrician. Results: Of the 595 participants, 585 (98.3%) responded to the survey, with 87.5% between 18-29 years of age, 58.8% without prior CPR training, and 93.3% without prior CPR experience. Reasons to hesitate starting bystander CPR in women included concern about exposing the victim (12.9%), being accused of sexual assault (6.1%), and possible pregnancy (6.0%). In participants with prior CPR training, 61.1% reported concerns about performing CPR on women, with 18.9% having concerns about performing chest compressions (CCs). Reasons for hesitating to perform CPR on female participants without prior CPR training, 73.2% reported having concerns about performing CPR on women. Causing injury and exposing the victim were top concerns to perform CPR on female patients, with 50.2% (p = 0.001) and 49.2% (p = 0.001), respectively and comfortable (14.5% and 9.3%, respectively) and confident (14.5% and 9.3%, respectively) in performing CPR in public. Causing injury was the top concern in performing CPR on geriatric (45.4%) and pediatric patients (41.7%), followed by fragility (18.1% and 18.1%, respectively). Lack of skills to perform CPR on children was reported in 22% of CPR-trained participants.

Conclusions: Public perception of OHCA victims influences willingness to perform bystander CPR. Factors such as age, gender, fear of injury, pregnancy status, and sexual assault concerns can negatively impact this life-saving intervention. Awareness of the importance of bystander CPR on any cardiac arrest victim must be improved.

134. TRENDS IN CALLS TO PARAMEDICS FOR SUSPECTED OPIOID OVERDOSES IN TORONTO, CANADA.
Russell MacDonald, Chris Olynyk, Adam Thomas, Jeremy De Pape, Rachel Rockman, Toronto Paramedic Services, University of Toronto (Category of submission: Student, Resident, Fellow)

Background: Health surveillance data sources specific to opioid overdose are not well defined. A novel collaboration between Toronto Paramedic Services (TPaS) and Toronto Public Health (TPH) allows for real-time monitoring of calls to TPaS for suspected opioid overdoses. A review of trends was conducted to better understand and respond to the opioid overdose crisis in Toronto, Canada.

Methods: Electronic patient care records for suspected opioid overdoses from August 2017 to July 2018 were reviewed. Suspected opioid overdoses were cases where paramedics suspected an opioid overdose on clinical grounds, naloxone was administered prior to paramedic arrival, or naloxone was administered by paramedics. Trends in the number and proportion of suspected opioid overdose calls by patient demographics, time of call, and geographic location were examined. Significant differences were estimated using overlapping confidence intervals calculated using a Poisson approximation of the binomial distribution.

Results: A total of 3,110 calls for suspected opioid overdoses were attended by paramedics on any cardiac arrest patient. The number of calls increased by 50.2% (p = 0.004) post-enrollment, a reduct of 133 calls per year. Conclusions: Following enrollment in a CP pilot program, participants’ use of the EMS system decreased by 50%. CP programs may be an effective way to support the most vulnerable patients and decrease EMS use. Further studies to more rigorously evaluate patient outcomes and assess the level of intervention are needed.

136. CAN 9-1-1 DISPATCHERS RELIABLY IDENTIFY PATIENTS SUFFERING A STROKE.
Thomas Arkins, Richard Sigle, David Page, Remle Crowe, Dustin Barton, Indianapolis Emergency Medical Services Category of submission: Medical

Background: The utilization of calls to 9-1-1 has been the primary access point for a majority of the U.S. population. These PSAP (public safety access points) are not all treated equal. Some agencies may use a recognized emergency medical dispatch (EMD) process whereas others may not. Despite millions of calls 9-1-1, the time to treatment is critical. Dispatchers are tasked with taking call information and sending resources based on the initial medical assessment. The quick identification of stroke improves outcomes. EMD is the one method used to determine the priority and type of the call. Objective: The objective of this study was to assess the effectiveness of a 9-1-1 dispatcher to reliably identify a patient who is suffering a stroke or transient ischaemic attack (TIA). Method: A retrospective analysis of de-identified data from the ESO Austin, TX database was used. The data set considered only run types listed as 9-1-1 responses with health data exchange (HDE) hospital outcomes of stroke or TIA from January 1, 2017 to December 31, 2017. Patients outcomes with ICD-10 the following codes were used: I60 - non-traumatic subarachnoid hemorrhage; I61 - non-traumatic intracerebral hemorrhage; I62 - other and unspecified non-traumatic intracranial hemorrhage I63 - cerebral infarction; G45 - transient cerebral ischemic attacks and related syndromes. Calculators for sensitivity and specificity of dispatcher identified stroke was incorporated to establish the confidence intervals displayed in the respective tables.

Results: A total of 2,199 cases were reviewed for decision and analysis. Dispatchers with in the given parameters of the study were able to correctly identify a stroke patient 39.5% (95% CI: 38.9%–40.9%) of the time. Sensitivity 38.9% (95% CI: 36.88–41.00), Specificity of 97.7% (95% CI: 97.53–97.83), Positive predictive value of 48.9% (95% CI: 46.54–51.00). Negative predictive value of 96.6% (95% CI: 96.48–96.67).

Conclusions: Dispatchers are not able to reliably identify a patient suffering a stroke or transient ischemic attack (TIA). Preliminary results showed that this is valid matter of the type of dispatch software that was being used.

137. UTILITY OF PREHOSPITAL CARDIAC BUNDLES OF CARE FOR IMPROVING KEEPS: PROVIDING TO CHEST PAIN PATIENTS IN THE FIELD.
Mark Pinchalk, Adam Palmer, James Dlutowski, John Mooney, Adam Studebaker, Simon Taxel, Jeff Reim, Jr., Chris Martin-Gill, Sara Hunsicker, City of Philadelphia (Category of submission: Professional)

Background: Patient care bundles have been advocated as a process based system to improve patient care and outcomes using evidence based guidelines. We sought to evaluate the effect of the implementation of a
prehospital care bundle on key interventions provided to patients presenting with chest pain and STEMI in the subset of these patients that were experiencing ST Elevation Myocardial Infarction (STEMI).

**Methods:**

Atypical chest pain, typical chest pain and STEMI care for patients ≥18 years of age presenting with chest pain or other symptoms of acute coronary syndrome (ACS) were implemented in an urban EMS system in 2015. Key interventions in the care bundles included acquiring a 12 Lead EKG in <10Minutes, Aspirin administration, IV access attempt and IV access success. Retrospective chart reviews on intermittent months were conducted comparing the pre intervention month of December 2014 to 2015–2018 performance. For patients presenting with STEMI, the percentage of cases meeting First Medical Contact (FMC) to Device Time <90minutes was compared from 2015–2018. Retrospective chart reviews on intermittent months were conducted comparing the pre intervention month of December 2014 to 2015 (170 cases), there was significant monthly improvement in key care bundle intervention completion from 2015:2018 (54.8% female, mean age 57.2 +/-SD 24.7 years). Incidence of response was associated with atypical & typical chest pain & STEMI, the percentage of cases meeting First Medical Contact (FMC) to Device Time <10 minutes improved from 70.6% to 89.7% (p<0.00001). Aspirin administration increased from 60.1% to 85.9% (p<0.00001). IV attempted improved from 68.5% to 75.2% (p=0.00046). There was significant utility to improvement in key care bundle intervention completion from 2015:2018 (170 cases), there was significant monthly improvement in key care bundle intervention completion from 2015:2018.

**Results:**

We included 529,058 responses (54.8% female, mean age 57.2 +/-SD 24.7 years). Incidence of response was associated with atypical & typical chest pain & STEMI, the percentage of cases meeting First Medical Contact (FMC) to Device Time <10 minutes improved from 70.6% to 89.7% (p<0.00001). Aspirin administration increased from 60.1% to 85.9% (p<0.00001). IV attempted improved from 68.5% to 75.2% (p=0.00046). There was significant utility to improvement in key care bundle intervention completion from 2015:2018 (170 cases), there was significant monthly improvement in key care bundle intervention completion from 2015:2018.

**Background:**

Asthma is a common pediatric diagnosis for Emergency Medical Services (EMS) transports, however there is a paucity of data on prehospital asthma management. The purpose of this study was to describe prehospital management of pediatric patients with suspected asthma on aerosol. Methods: We conducted a retrospective review of electronic reports from 24 EMS agencies in Western Pennsylvania between January 1, 2014 and December 31, 2017. We identified patients 2–17 years old with documented wheezing, excluding those with suspected anaphylaxis. Patients with documented respiratory distress, agitation, fatigue, grunting, labored and assisted breathing, nasal flaring, retractions, tachypnea for age, hypoxia (SpO2 <90%), or cyanosis were classified as severe asthma. We abstracted and reported descriptive statistics of demographics, vital signs, and management including administration of medications (bronchodilators, magnesium, steroids, epinephrine, intravenous fluids) and procedures (intravenous [IV]/intravenous [IO] access, continuous positive airway pressure [CPAP], endotracheal intubation [ETI], and supraglottic airways). Results: Of 19,246 pediatric transports, 956 (4.9%) patients had documented wheezing. Of these, 487 (51%) met criteria for severe asthma. Approximately half of patients with asthma were <2 years of age in the 2–5 year age group (n=232, 49%). Patients with nonsevere asthma were majority male (n=292, 61%) and 179 (37%) were Black. Tracheal intubations given to patients included albuterol (n=269, 56%), combination albuterol/ipratropium (n=195, 41%), methylprednisolone (n=12, 2.5%), oxygen (n=110, 20%), and epinephrine (n=2, 0.4%). A total of 37 patients (7%) received a peripheral IV line. One patient showed evidence of anaphylaxis. The imple-
Background: Remote Ischemic Conditioning (RIC) is a promising prehospital therapy that may ameliorate chest pain during an acute myocardial infarction (STEMI). RIC is administered non-invasively with timed inflations and deflations of an upper arm cuff. We assessed tolerance to RIC in chest pain patients administered RIC by EMS during transport to the hospital. Methods: We are conducting a pilot study of the feasibility of prehospital delivery of RIC in a U.S. EMS system. From July to December 2018, we are enrolling 30 patients experiencing chest pain symptoms (but not meeting STEMI criteria) and requesting 9-1-1 response and ambulance transport to an academic emergency department. Using an automated device, the 40-minute RIC procedure (5 cycles of 5 minutes inflated and 5 minutes deflated) is initiated by paramedics during ground transport. Upon completion of the procedure, patients are asked to rate the level of discomfort due to RIC on a scale from 0 (no discomfort) to 10 (maximum possible discomfort). We also conduct semi-structured interviews of patients’ experiences with RIC. Results: In July 2018, 6 participants were enrolled. The mean age was 54 years, and 67% were female. Three participants (50%) completed all 4 cycles while one had an unexplained interruption after the second cycle. In 2 participants, a device or operator error occurred during initiation. Of 4 participants receiving at least 2 cycles, the mean discomfort reported was 2.75. Two participants (50%) reported discomfort during the procedure though none asked to have RIC stopped due to discomfort. Common themes from participant interviews were that RIC felt like a blood pressure cuff and that RIC squeezed and felt tight around the arm. Conclusions: Our preliminary results suggest that RIC is well tolerated by chest pain patients transported by EMS. To our knowledge, our ongoing pilot study is the first in the U.S. assessing the feasibility of initiating RIC during ground ambulance transport. We intend to use these pilot data to inform the design of a prehospital trial of RIC in acute STEMI.

142. CHARACTERISTICS AND SPATIAL DISTRIBUTION OF EMS PROFESSIONALS IN MASSACHUSETTS

Rebecca Cash, Madison Rivard, Ashish Panchal, National Registry of EMTs Category of Submission: Operations, Quality, Safety Systems

Background: Volunteers working in EMS are believed to cluster in rural areas; however, a minimal amount is known concerning the geographic distribution of volunteers and community demographics where volunteerism is high. Methods: We determined the spatial distribution of volunteers in Massachusetts and compare community characteristics of high and low volunteer areas. Results: We conducted a cross-sectional analysis of EMS professionals in Massachusetts that recertified their National EMS Certification from October 1, 2017 to March 31, 2018. Of these, we defined volunteers as those with >50% volunteer EMS professionals. Spatial clustering was determined using Moran’s I, nearest neighbor ratio (NNR), and the Getis-Ord Gi* statistic. Census tract-level demographic characteristics (population density, median household income, educational attainment) were determined using 2010 American Community Survey 5-year estimates. Chi-square and Wilcoxon rank sum tests were used to compare community characteristics in high and low volunteer areas. Conclusion: The results of this study are promising uses (e.g., monitoring ETCO2 setting may have significant implications for improving ventilatory care among intubated patients because identifying and correcting hypocapnia/hyperventilation in actively-ventilated cases is extraordinarily important. The low concordance rates may be due to the emphasis on discreet, intermittent vital sign documentation rather than ongoing identification and documentation of significant ETCO2 variation.

143. PREHOSPITAL END-TIDAL CO2 MEASUREMENT IN NON-INTUBATED TRAUMATIC BRAIN INJURY PATIENTS: CONCORDANCE BETWEEN EMS PROVIDER DOCUMENTATION AND NON-INVASIVE MONITOR DATA TRACKING

Octavio Perez, Daniel Spaite, Eric Helfenbein, Saeed Babaeizadeh, Dawn Jorgenson, Chengcheng Hu, Joshua Gaither, Amber Rice, Samuel Keim, Bruce Barnhart, The University of Arizona Category of Submission: Operations, Quality, Safety Systems

Background: End-tidal CO2 (ETCO2) monitoring is valuable in the management of traumatic brain injury (TBI). In intubated patients, it helps prevent over-ventilation. In non-intubated patients, placing a sensor in the nares allows accurate monitoring of respiratory rate and has other promising uses (e.g., monitoring ETCO2 trends in worsening TBI, COPD, etc.). Objective: The objective of this study was to identify how accurately EMS providers document ETCO2, we compared the values recorded in EMS patient care records (PCRs) to monitor data for 47 TBI patients. Methods: Cases from 6 EMS agencies reporting continuous monitor data (Phillips MRx) in the Epic Study (NIH R01 TR043749) were evaluated. All ETCO2 data available for this post-hoc review were displayed and accessible to the EMS providers during care. Concordance was defined in 2 ways (for both highest and lowest ETCO2): <5 and <3 mmHg difference between the monitor data and PCR-documented values. Results: 106 cases were included (median age: 47 years, 91%, 66% male). The highest PCR-recorded vs. monitor ETCO2 values had excellent concordance for a difference of <3 mmHg (14.4% for ≤5 mmHg, and 31% for ≤3 mmHg). Conclusions: The failure to accurately document low ETCO2 in a “passive-ventilation” setting is extremely concerning and may have significant implications for improving ventilatory care among intubated patients because identifying and correcting hypocapnia/hyperventilation in actively-ventilated cases is extraordinarily important. The low concordance rates may be due to the emphasis on discreet, intermittent vital sign documentation rather than ongoing identification and documentation of significant ETCO2 variation.

144. ASSOCIATION BETWEEN AWARENESS TIME INTERVAL AND OUTCOMES IN OUT-OF-HOSPITAL CARDIAC ARREST

Seo Young Ko, Sang Do Shin, Kyoun Jung Song, Jong Ho Park, Young Sun Ro, Seung Chul Lee, Department of Emergency Medicine, Jeju National University Hospital Category of Submission: Cardiac Arrest

Background: Early calling for Emergency medical services (EMS) can lead early diagnosis and treatment of out-of-hospital cardiac arrest (OHCA). Early EMS response, and consequently provide early cardiopulmonary resuscitation (CPR) and defibrillation processes. This study aims to determine the association between the time interval from awareness of OHCA to call for EMS service by lay person and outcomes in OHCA.

Methods: EMS-treated, witnessed, and adult OHCAs (> 15 years) with presumed cardiac etiology between 2013 and 2016 were analyzed, excluding patients with unknown time factors and outcomes. The mean exposure was awareness time interval (ATI) from time interval from awareness of OHCA to calling EMS service. Patients were classified with 4 ATI groups; group 1(0-19 seconds), group 2(20-59 seconds), group 3(60-359 seconds), and group 4(360-seconds). The outcomes were cerebral performance category 1 or 2 (good CTC). Multivariable logistic regression analysis was performed to calculate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for outcomes by one-minute delay of ATI and ATI group (reference: group 1). We compared the difference of ATI on outcomes across 3 witness groups (Layperson, Family, and Unknown) Results: A total 30,291 OHCAs [9.4% (group 1), 14.4% (group 2), 10.5% (group 3), and 25.7% (group 4)] were finally analyzed. Good CPC were 10.1% for group 1, 10.5% for group 2, 2.4% for group 3, 2.4%
for group 4, respectively. AORs (95% CIs) by one-minute delay was 0.95 (0.94–0.97) for outcome 1 for group 4, 0.75 (0.62–0.91) for group 3 and 0.51 (0.42–0.61) for group 4, respectively. AORs (95% CIs) by group 1 for outcome were 2.24 (1.90–2.63) for group 2, 1.65 (1.32–2.06) for group 3 and 0.85 (0.63–0.85) for group 4 for Family-witnessed OHCA, respectively.

**Conclusions:** A longer ATI in witnessed adult OHCAs was associated with poor neurological recovery. A one-minute delay in ATI was associated with a 5% decreased of good neurological recovery and the effect was significantly increased in Family-witnessed OHCA.

145. **NUMBER OF PREHOSPITAL DEFIBRILLATION ATTEMPTS AND NEUROLOGICAL FAVORABLE OUTCOME IN OUT-OF-HOSPITAL CARDIAC ARREST WITH INITIAL SHOCKABLE RHYTHMS**

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**Background:** The early and timely defibrillation is one of the key elements of out-of-hospital cardiac arrest (OHCA) by prehospital EMS providers is crucial for successful resuscitation. In emergency medical service (EMS) systems, where advanced cardiac life support support could not be fully provided before hospital transport, optimal range of prehospital defibrillation attempts is debatable. We evaluated association between the number of prehospital defibrillation attempts and survival outcomes in OHCA patients who were unresponsive to field resuscitation and defibrillation.

**Methods:** This is a retrospective, observational study using a nationwide registry of Korea from 2013 to 2016. Adult EMS-treated OHCA patients with presumed cardiac origin with shockable initial ECG were enrolled. Final analysis was performed in patients who did not achieve return of spontaneous circulation (ROSC) on scene before hospital transport. We categorized the number of prehospital defibrillation attempts into 3 groups: ≤3 attempts, 4–5 attempts and ≥6 attempts. Primary outcome was favorable neurological recovery (cerebral performance category 1 or 2) at hospital discharge. Multivariable logistic regression modeling was used to evaluate association between neurological outcome and defibrillation attempts, adjusting for potential confounders.

**Results:** A total of 6,679 patients were enrolled for final analysis. Among total ≤3 defibrillation attempts were attempted in 5,015 patients (75.1%), 1,050 patients (15.7%) for 4–5 attempts, and 114 patients (2.9%) for ≥6 attempts. Although survival to discharge rate was highest in the group with ≤3 defibrillation attempts (8.1% vs. 7.5% vs. 2.9%, p < 0.01), survival rate with favorable neurological outcome was highest in group with 4–5 defibrillation attempts (3.0% vs. 4.5% vs. 2.1%, p = 0.02). As 4–5 attempts group referred with presumed cardiac arrest with shockable rhythm, all patients were unresponsive to field defibrillation and resuscitation, too small a number (less than 3) or too large a number (more than 6) of defibrillation attempts in the field were associated with poor neurological recovery compared with 3 attempts and ≥6 attempts (p < 0.01, OR 4–5). This study suggests that the number of defibrillation attempts at the scene in limited service systems for providing advanced life support should be protocollized and optimized.

146. **A VARIETY OF SUPRAGLOTTIC AIRWAY DEVICES ARE SAFE FOR USE DURING HEAD UP CARDIOPULMONARY RESUSCITATION**

Johanna Moore, Joe Holley, Michael Jacobs, Scott Youngquist, Bayert Salvadora, Carolina Rojas-Salvador, Ralph Frascone, Charles Hick, Guillaume Debaty, Keith Lurie, Department of Emergency Medicine, Hennepin County Medical Center

**Background:** Head Up (HUP) cardiopulmonary resuscitation has potential to improve neurological survival after cardiac arrest. Practical information regarding HUP CPR implementation is needed as it is poised to enter human evaluation. It is unknown if there is an optimal supraglottic airway device (SGA) for performance of HUP CPR, which involves a transition of head and shoulder elevation during resuscitation.

**Methods:** Active Compression-Decompression (ACD) CPR with an Impedance Threshold Device (ITD) was performed in the flat and HUP positions for periods of 20 seconds in a human cadaver model. Airway pressures (AP), Intracranial Pressure (ICP), and aortic pressures were continuously measured using high fidelity pressure catheters. Positive pressure ventilation was provided by endotracheal tube (ETT) and 5 SGA devices (Combitube, King LT-D, LMA Protector, i-gel, LT-D, i-gel), tested in a randomized order among cadavers at a rate of 10 breaths/min, with tidal volume 600 mL with a compression:ventilation rate of 10:1. Student’s t-test and one-way ANOVA tests were performed for analysis.

**Results:** 7 cadavers were studied. The mean decompression airway pressures (mean ± SD, mmHg) were similar between airway devices (ETT) and 5 SGA devices (Combitube, King LT-D, LMA Protector, Air-Q LMA, i-gel), LT-D, LMA Protector, Air-Q LMA, i-gel), tested in a randomized order among cadavers at a rate of 10 breaths/min, with tidal volume 600 mL with a compression:ventilation rate of 10:1. Student’s t-test and one-way ANOVA tests were performed for analysis. Results: 7 cadavers were studied. The mean decompression airway pressures (mean ± SD, mmHg) were similar between airway devices (ETT) and 5 SGA devices (Combitube, King LT-D, LMA Protector, Air-Q LMA, i-gel), LT-D, LMA Protector, Air-Q LMA, i-gel), tested in a randomized order among cadavers at a rate of 10 breaths/min, with tidal volume 600 mL with a compression:ventilation rate of 10:1. Student’s t-test and one-way ANOVA tests were performed for analysis.

**Conclusions:** Similar APs were observed for group 1 for outcome were 2.24 (1.90–2.63) for group 2, 1.65 (1.32–2.06) for group 3 and 0.85 (0.63–0.85) for group 4 for Family-witnessed OHCA, respectively.

**Conclusions:** A longer ATI in witnessed adult OHCAs was associated with poor neurological recovery. A one-minute delay in ATI was associated with a 5% decreased of good neurological recovery and the effect was significantly increased in Family-witnessed OHCA.

147. **STRENGTHENING MANAGEMENT OF BRONCHOSPASM: STEROID ADMINISTRATION FOR ASTHMA IN STATEWIDE TREATMENT PROTOCOLS**

Christie Fritz, Anthony Mahoney-Pacheco, Andrew Petel, David Schoenfeld, Beth Israeli Deaconess Medical Center/Harvard Medical School

**Background:** Asthma is a common emergency department complaint, accounting for ~1.8 million ED visits yearly in the U.S. Inhaled bronchodilators as well as steroids are mainstays in treatment for acute exacerbations. Research has demonstrated that early steroid administration significantly reduces hospital admission for adults as well as pediatrics, as well as preventing relapses. This benefit is greatest when administered in the first hour of ED admission. The purpose of this investigation is to describe the overall prevalence of steroid administration in asthma Statewide Treatment Protocols (STPs) and the characteristics of those protocols.

**Methods:** Cross-sectional study of STPs using a standardized review of protocols for asthma, wheezing or respiratory distress. Protocol revision date was also captured. **Results:** A total of 34 out of 50 (68%) states issue ALS STPs, 10 of which serve as guidelines. IV steroids are included as an approved medication for wheezing or asthma in 24 (71%) of STPs. Methylprednisolone is the most common steroid with 23 (66%) of states including it in their wheezing protocols. Desamethasone was included in 6 (21%) STPs, hydrocortisone was included in 2 (8%) protocols, and oral Prednisone was included in one protocol (4%). Multiple steroid options were available in eight STPs. 76% of protocols have been revised since 2015. **Conclusions:** EMS administration of steroids as part of asthma treatment would serve as the earliest administration point in the emergency response system. Despite demonstrated benefit of early administration of steroids, 24 states do not allow for EMS administration of steroids. Protocol revision cycles are unlikely to be a primary contributor as most protocols have been revised within 3 years. States are encouraged to examine the barriers to introduction of steroids for asthma in STPs.

148. **EVALUATION OF PHYSICIANS’ ATTITUDES REGARDING TRANSPORT MODALITIES**

Jeffrey Luk, Grant Whiter, Savanna Smoker, University Hospitals Cleveland Medical Center/CWRU School of Medicine

**Background:** Hospital mergers have made interhospital transfers for patients more difficult to manage. The solidification of medical services. Physicians must make decisions on the level of interfacility transport modalities (ITMs). Previous studies examined the importance of factors involved in choosing ITMs. A minimal amount is known about physicians’ perception of ITMs and factors considered when transferring patients. We sought to assess physicians’ knowledge of and comfort with ITMs.

**Methods:** An electronic survey was distributed via REDCap to 2510 physicians in a large healthcare system. A reminder survey was sent 11 weeks later with instructions to avoid duplicate responses. Participation was voluntary. Respondents were assured anonymity. Overall mean and median Likert values (LVs) for emergency medicine physicians (EMP) and critical care physicians (CCP) were compared to those for non-critical care physicians (NCCP) using Student’s t-test and Mann-Whitney test, respectively. The IRB deemed this study exempt.

**Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt. **Results:** A total of 181 physicians responded. 63% practice in the U.S. In 181 physicians responded. 63% practice in the U.S. 76% of respondents deemed this study exempt.
and 7 for knowledge in choosing ground vs. air critical care transport (CCT), respectively. Of the 169 physicians that identified a spe-
cialty, 69 were EMs/CCPs and 100 were NCCPs. For the aforementioned categories examined, mean and median LVs were statist-
ically significantly higher for EMs/CCPs compared to NCCPs (p < 0.001 among all categories). The most important factor for using ground or air CCT was patient stability with the second most important factor being speed. 60% of all respondents (50% of EMs/CCPs and 67% of NCCPs) believed air CCT to be typically faster than ground. The majority (77%) believes that consultation with the accepting physician assists with ITM choice. A total of 23% of respondents do not factor patient comfort into their ITM decision. Conclusions: This study shows that EMs/CCPs seem to be more comfortable with different ITMs than NCCPs. Educational activities about the use of appro-
priate ITMs should be targeted towards NCCP. Further research could evaluate whether educational interventions lead to a more appropriate use of the various ITMs.

149. PERFORMANCE AND QUALITY COMPARISONS FOR DISPATCHER-ASSISTED TELEPHONE CARDIOPULMONARY RESuscitation (DATCPR) INSTRUCTIONS TO ACHIEVE BETTER WITH EMERGENCY MEDICAL TECHNICIANS (EMTs) AND REGISTERED NURSES (RN)s

Patrick Chow-In Ko, Mei-Fen Yang, Kah-Meng Chong, Hui-Chih Wang, Chun-Wei Chen, Chun-Hua Hu, Fu-Ping Yen, Yao-Chang Wang, Hong-Yi Hsiao, Matthew Hsu, Min, Min-Jen Tsai, Lin, National Taiwan University Hospital, CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Performance and quality of DATCPR instructions between EMT and RN are not well known. In vertical dispatch style, call-taker and CPR instructor would be the same EMT; in horizontal dispatch style, call-taker and CPR instructor would be EMT while CPR instructor could be RN to takeover the calls of recognized OHCA case. This study was to compare the quality of DATCPR instructions performed between EMTs and RNs. Methods: A retrospective observational database prospectively collected from a metropolitan OHCA-DATCPR registry with one centralized dispatch center and EMT as all call-takers. After call-takers recognizing patients as cardiac arrest, they could directly launch DATCPR instructions by themselves (iEMT) or transfer calls to RN (iRN) for DATCPR instructions. Both of them were well trained for DATCPR skills. All audio call records eligible for non-traumatic OHCA were assessed by experienced third person afterhang of the training. DATCPR instructions included: bystander-starting chest compressions (CC), persistent online CPR instruction until un-

150. URBAN-RURAL DIFFERENCES IN PREHOSPITAL TIME INTERVALS FOR SUSPECTED ST-ELEVATION MYOCARDIAL INFARCTION PATIENTS IN NORTH CAROLINA


Background: Acute ST-elevation myocardial infarction (STEMI) is a high-risk, time-sensitive condition. Timeliness of emergency services (EMS) response, care, and transport can signifi-

151. CARDIOPULMONARY RESUSCITATION QUALITY BETWEEN A NEW DISPATCH-ASSISTED BASIC LIFE SUPPORT VERSUS STANDARD BLS SUPPORT TRAINING: A CLUSTER RANDOMIZED CONTROLLED TRIAL

Gwan Jin Park, So Yeon Joyce Kong, Kyoun Jun Song, Sang Do Shin, Tae Han Kim, Young Sun Ro, Helge Myklebust, Tonje Kor, Soraa Birkenes, Department of Emergency Medicine, National University Hospital, KOREA CATEGORY OF SUBMISSION: MEDICAL

Background: Dispatcher-assisted cardiopulmonary resuscitation (CPR) is the important CPR program to increase the bystander CPR rate for out-of-hospital cardiac arrest (OHCA). Standard traditional basic life sup-

152. USING EMERGENCY MEDICAL SERVICES PROVIDERS AND CRISIS CLINICS IN THE WAKE OF THE MENTAL HEALTH CRISIS: ASSESSMENT OF THE ACCURACY AND SAFETY OF A NOVEL PROTOCOL

Cyr Julianne, Owino Hillary, Bush Montika, Glickman Seth, The University of North Carolina at Chapel Hill Category of
Background: With the increase in mental health patients seeking Emergency Department (ED) care, the burden of lengthy boarding, overcrowding, and limited resources grows. Engaging Emergency Medical Services (EMS) and other healthcare facilities in the care of these patients may provide a solution. In a large North Carolina (NC) county developed a program to assess mental health patients and provide transport to an ED or to a mental health crisis center (MHCC) based on screening criteria. The purpose of this study was to evaluate the efficiency and safety of the EMS protocol for assessing and transporting mental health crisis patients.

Methods: This was a retrospective cohort study of patients evaluated by Advanced Practice Paramedics (APP) between August 2013 and July 2014. Prehospital patient care records, APP records, and hospital records were reviewed. EMS protocol accuracy and safety were evaluated using: correct APP application of screening criteria; and agreement of protocol-recommended destination; and actual transport destination. Patient demographics and disposition were described. Results: In total, 1,369 patients were transported by APPs. The sample included 52.0% males, 62.2% white, and 94.7% not Hispanic or Latino. Median age was 40 years. Of this sample, 334 patients were transported to a MHCC and 1,035 were transported to an ED. Forty-three (4.6%) patients passed all screening criteria. Of these patients, 16.8% (n = 216) were transported to a MHCC; secondary transfers to an ED occurred in 18 documented cases. Of patients who failed screening criteria, 51.8% (n = 666) were transported to an ED and 5.7% (n = 73) were transported to a MHCC. Compared to the ED, admissions and discharges home were lower for MHCC patients (26.2% vs. 42.5% and 18.3% vs. 33.2%, respectively), while transfer to detox or inpatient psychiatric care was higher (40.8% vs. 22.0%). Conclusions: Prehospital transport to a MHCC is an under-utilized avenue to mental health and substance abuse crisis care. Compared to ED patients, MHCC patients were more often transferred to detox and inpatient psychiatric care and relatively few cases necessitated secondary transport to an ED. Further APP training in applying screening criteria and communicating patient care options are necessary.

Background: Drug overdose led to more than half a million deaths in the United States in the last 10 years, two-thirds of which were opioid-related. This data comes from emergency department and hospital records, but does not describe the burden to the 9-1-1 system. In this study, we use the National EMS Information System (NEMSIS) database to estimate the volume of emergency calls, interventions, and demographics of patients with suspected opioid overdose.

Methods: We performed an observational, cross-sectional study of patients with an EMT (Emergency Medical Technician) impression of “Alcohol Intoxication or Drug Overdose” in the years 2014 and 2016. To identify opioid overdose, we further filtered by EMT treatment of patients with naloxone. To examine severity of the overdose, we organized data by level of response, interventions performed and transport destination. To explore patient and geographic differences, we also considered age, sex, race/ethnicity, and metropolitan status. Results are presented as proportions with 95% Confidence Intervals (CIs) with statistical tests of significance used, as appropriate. Results: We identified a total of 1,037,556 (1.86% 95% CI: 1.86–1.88) emergency calls for patients with provider primary impression of alcohol and/or drug overdose. Of those, 81,336 (7.84% 95% CI: 7.79–7.9) patients were given naloxone. Naloxone utilization increased from 26,838 (6.59%, 95% CI: 6.52–6.67) administrations in 2014 to 52,498 (8.75% 95% CI: 8.68–8.82) in 2016. Men were 1.61 times more likely to be given naloxone (95% CI: 1.59–1.62, p < 0.001). The burden was highest in urban areas (0.48% 95% CI: 0.48–0.49). Conclusions: This study represents an important description of the increasing severity and prevalence of the opioid epidemic on a national level from 2014 to 2016. Better understanding the burden on the EMS system from a national perspective, we can reduce opioid-related deaths by optimizing the efficiency of the EMS system.

Background: Acute pain is a common reason for requesting EMS. In the current opioid crisis, the indiscriminate use of narcotics for pain management has received renewed scrutiny. The purpose of the current study was to describe advanced life support (ALS) intercepts for management of acute back pain.

Methods: This was a retrospective descriptive analysis of intercepts performed between January 2017 and April 2018 by a single ALS agency serving multiple sites, including urban, suburban, and rural communities. Intercepts were identified based on label of run forms. Included runs were exported to a Microsoft Excel database and analyzed for patient characteristics, primary impression, and interventions as documented by the intercepting paramedics. Results: 456 requests were made for ALS intercept, of which 21 (4.6%) were requested for back pain. 13 (61.9%) were female. A total of 14 (66.7%) were classified as medical etiology, while 7 (33.3%) were classified as acute traumatic pain. Average age was 45.4 ± 17.3 years for trauma, compared with 50.6 ± 10.2 years for medical causes. Twenty (95.2%) patients received parenteral opioid analgesia for back pain, more frequently than other intercepts (OR 61.31, 95% CI: 8.31–462.7), and 15 (85.7%) intercepts were coded as an emergent response for intercept by dispatch. One (4.8%) was transported emergently. Scene time during the intercept resulted in 20.6 ± 9.9 min delay from the time of starting resuscitation to emergency department (ED) or at the time of survived to arrival at ED after EMS resuscitation. The primary outcome was good neurologic recovery at discharge measured by the cerebral performance category (CPC 1 or 2). Multivariable logistic regression analysis was done for calculating adjusted odds ratios (AORs) with 95% confidence intervals (CIs) to estimate the effect of serum albumin level on outcome of OHCA. Results: Of 1,616 EMS-treated OHCA patients, with presumed cardiac etiology, total 1,013 OHCA were analyzed. OHCA who had serum albumin level less than 3.5 g/dL was 452 (44.6%) patients. The higher albumin group showed much better outcomes than lower albumin group. 95% CIs of higher albumin group vs. lower albumin group were 2.94 (1.57–5.49) for good neurological recovery and 1.74 (1.10–2.76) for survival to discharge, respectively. Conclusions: Lower serum albumin levels than 3.5 mg/dL measured at the time of arrival to emergency department of OHCA patients was associated with poor outcomes than higher serum level.
Background: Traumatic brain injury (TBI) in children is an important health concern that results in many emergency department (ED) visits and hospitalizations. Sports injuries are a common cause of pediatric TBI. However, information on the demographics, clinical characteristics, and outcomes of sports-related TBI is limited.

Methods: This is a multi-center observational study using the Emergency Department-Based Injury Surveillance System (EDISS) database of Korea. Patients between 5 and 18 years, who had unintentional, sports-related head injury between January 2011 and December 2016 were included. Patients with unknown information about the type of sports were excluded. The main exposure was the type of sport that was classified into 6 categories (field sports, floor sports, bicycle & street sports, water sports, racket sports, others). The primary outcome was TBI, and secondary outcome was admission. Multivariable logistic regression analysis was performed to calculate adjusted odds ratios (AORs) with 95% confidence intervals (CIs) by grouping (reference, field sports group).

Results: Of 1,537,617 injured patients, 10,717 (0.7%) patients were eligible pediatric TBI for study inclusion. The most prevalent sports-related group category was field sports (51.8%). Most of the patients were male (67.5%), and proportion of TBI and admission with severe TBI was female compared to male (p-value: 0.001). AOR of TBI compared to field sports was 1.77 (1.37–2.28) in bicycle and street sports, 0.87 (0.76–0.99) in floor sports, 0.59 (0.44–0.80) in water sports, and 0.27 (0.18–0.40) in racket sports. The AORs of admission compared to field sports were 2.11 (1.39–3.52) in bicycle and street sports, 1.83 (1.21–2.76) in racket sports, and 0.37 (0.16–0.85) in water sports. The clinical characteristics of pediatric sports-related TBI are affected by sports type and significantly different. The study proposes prevention strategies for sports-related TBI can be developed by sports type.

157. DEVELOPMENT OF ANTHROPOMETRIC GUIDANCE FOR FIELD FITTING OF TRAUMA DEVICES (TARNUQUETS AND PELVIC SBLINGERS) FOR INJURED CHILDREN
Jennifer Anders, Joseph Robert Kelly, Oluwatemilade Badaki, Jose Reyes, Johns Hopkins University Category of Submission: Pediatric

Background: Weight and age are the most commonly used metrics for determining dosing and sizing of pediatric interventions. However, often, neither are readily available in the acute prehospital or Emergency Department setting. While height is commonly used to estimate weight, we looked to see if height alone was more accurately related with pelvic and extremity circumference. The goal was to aid in the fitting of point of injury interventions like pelvic stabilizers and tourniquets. Methods: We recruited healthy subjects aged 1–18 years. Height and weight were obtained from parents, medical record, or measured directly. Subjects were also measured on the Broselow TapeTM and fitted for the Pediatric PelvicBinderTM and the Small SAM Pelvic SlingTM. Pelvic, upper extremity and lower extremity circumferences were measured directly. Extremity circumferences were obtained at the most proximal practical location to best match the location of injury tourniquet placement. Univariate & multivariate regression methods were utilized to determine variables associated with pelvic stabilizer fit, pelvic and extremity circumference. Results: Age, height and weight were all good predictors of pelvic, arm and leg circumference when taken individually in univariate analysis (p < 0.001). However, only weight showed significant correlation with all the circumferences in multivariate analyses. Multivariate coefficient p-values are: Age [p-value: 0.59 (pelvic circumference)]; p-value: 0.02 (arm circumference); p-value: 0.06 (leg circumference)]. Height [p-value: 0.68 (pelvic circumference); p-value: 0.25 (arm circumference); p-value: 0.26 (leg circumference)]; and Weight [p-value: 0.00 (pelvic circumference); p-value: 0.00 (arm circumference); p-value: 0.00 (leg circumference)]. When height on the Broselow TapeTM was taken as a dichotomous variable, regression analysis showed perfect prediction of fit for pelvic stabilizers. All subjects with height below the Broselow TapeTM range fit the Pediatric PelvicBinderTM and all those taller than expected by small SAM Pelvic SlingTM. Conclusions: Weight was the most accurate predictor of pelvic and extremity circumferences, consistent with common current practice for pediatric dosing and equipment selection. However, the Broselow TapeTM was an excellent screen for pelvic stabilizer fit and height showed a strong univariate correlation between body height and weight. Height and weight are practical measures for prehospital use as pelvic binders and tourniquets become more common.

158. HEMODYNAMIC CHANGES IN AEROMEDICAL PATIENTS UNDERGOING RAPID SEQUENCE INTUBATION WITH ETOMIDATE OR KETAMINE
Scott Alan Kunkel, Timothy Lenz, Medical College of Wisconsin, Flight For Life Category of Submission: Student, Resident, Fellow

Background: Rapid sequence intubation is frequently performed by aeromedical providers to establish control of the airway. Common induction agents are etomidate and ketamine, both touted to have relatively stable hemodynamic profiles. There is limited data comparing these medications in the aeromedical setting. This study compares administration of etomidate and ketamine on intubation hemodynamics. Methods: A retrospective, prehospital chart review of intubations performed by an aeromedical program from January 2012 to September 2017 was completed. Primary outcome measures included percentage change in heart rate (HR), percentage change in systolic blood pressure (SBP), and incidence of hypotension with the use of etomidate or ketamine as induction agents. A p-value < 0.05 was considered statistically significant. Results: In our study, 258 patients were induced with etomidate and 48 with ketamine. Etomidate patients showed a -1.2% (SD +/− 22.7) change in HR and 0.52% (SD +/− 25.0) change in SBP. Ketamine patients showed a -4.7% (SD +/− 16.7) change in HR and 15.3% (SD +/− 39.8) change in SBP. The p-values for percentage change in HR and SBP between etomidate and ketamine were 0.0094 and 0.0206, respectively. There were 25 episodes of post-administration hypotension with etomidate and 2 with ketamine (p = 0.58). Both etomidate and ketamine are appropriate induction agents for intubation in the aeromedical environment. Ketamine was preferentially selected for induction of known hypotensive patients with a statistically significant improvement in SBP. Although hypotensive events were statistically significant, neither agent caused overtly increased incidences of hypotension.

159. COMPARING CHEST COMPRESSION QUALITY BETWEEN USING STRETCHER AND TRANSFER SHEET FOR OUT-OF-HOSPITAL CARDIAC ARREST PATIENT TRANSPORT IN HIGH-RISING BUILDING
Patrick Chow-In Ko, Chien-Yu Chi, Desmond Mao, Mei-Fen Yang, Chih-Wei Yang, National Taiwan University Hospital Category of Submission: Cardiac

Background: Traditionally, stretcher is usually used for patient transport. However, it may be limited in confined space, like in elevator. Using a transfer sheet instead may be an alternative way especially in high-rising building that has not been explored before. This study aims to compare the quality of manual chest compression (CC) for patient transport in high-rising building between using a stretcher and a transfer sheet. Methods: This was a crossover stimulation study. The subjects were emergency medical technicians (EMT) and were assigned to 12 three-staff teams. Each team performed 6 runs of manikin transport for cardiac arrest scenario from thirteenth floor to ground floor by elevator, including 2 runs by transfer sheet (TS) and 4 runs by stretcher which was added to 45-degree (S45) or 90-degree (S90) head-up when entering elevator. Chest compression quality was measured by a manikin (Resusci-Anne Modular System, Laerdal Inc.) before (on-scene phase) and after (transport phase) the manikin was moved to transfer sheet or stretcher. The elevator was 1.6 meter in length, 1.3 meter in width and 2.2 meter in height. Results: There was no chest compression quality difference between each group in on-scene phase. In transport phase, using transfer sheet had greater mean chest compression depth (TS: 54.4 ± 4.2 mm vs. S45: 39.6 ± 7.2 mm, p < 0.001; TS: 54.4 ± 4.2 mm vs. S90: 40.05 ± 8.30 mm, p < 0.001), greater percentage of deep enough compression (TS: 95.0% ± 25.6 sec, p < 0.001), greater percentage of compression time ≥80% (TS: 94.5% ± 25.6 sec, p < 0.001), and shorter transporting time (TS: 143.1 ± 11.4 sec vs. S45: 151.6 ± 13.9 sec, p < 0.001; TS: 143.1 ± 11.4 sec vs. S90: 167.1 ± 25.6 sec, p < 0.001). In the contrary, using transfer sheet had lower percentage of fully recoil compared with using stretcher in 45-degree (TS: 42.3 ± 30.5% vs. S45: 60.7 ± 28.6%, p = 0.04). There was no difference of no flow fraction, percentage of correct hand position and mean rate of compression between TS and stretcher in transport phase. Conclusions: Using transfer sheet seems a better alternative way than using stretcher for cardiac arrest patient transport in high-rising building.

160. COMPARISON BETWEEN COLOR-CODED SYRINGES AND AN FDA-APPROVED VALIDATION METHOD FOR PEDIATRIC DOING: USING MIDAZOLAM
Caitlin Howard, Kristy Jeffers, Allyson Axtell, Diane Montano, Crystal Williams, SALS/HEC Military EMS and Disaster Medicine Fellowship Category of Submission: Pediatric

Background: Nearly 30% of pediatric medica-
medication errors when administering midazolam. This method was compared to a U.S. Food and Drug Administration (FDA)- approved validation method. Methods: A prospective, block-randomized, crossover trial was conducted to compare the dosing accuracy of the color-only method vs. the validation method. Twenty participants prepared pediatric midazolam doses according to their preferred method, an FDA-approved validation method, and a color-coded syringe (color-only method) in a simulated setting. Primary endpoints included dosing accuracy and time to medication administration. Secondary endpoints included participant’s perceived personal error rate and the ease of use, perceived stress reduction, and perceived potential for error reduction by the color-only method. Continuous outcomes (time to completion, percent errors) between the color-only and validation methods were compared using Wilcoxon signed rank test for paired means and McNemar test for paired differences with distribution-free 95% confidence intervals was calculated. Results: The preferred 3 kg calculations had a median time of 55.6 seconds, a median time to completion of 56.6 seconds, and critical errors occurred in 8/20 trials. The color-only method took less time to complete than the validation method (p = 0.014). There were no statistically significant differences in accuracy and time to medication administration between the color-only method and the validation method. Conclusions: There were no significant differences in accuracy and time to medication administration between the color-only method and the validation method. Use of a color-coded syringe did reduce time to medication administration when compared to a preferred method and an FDA-approved validation method.

162. SURVEY TO DETERMINE KNOWLEDGE OF MASS CASUALTY POLICY AT A LEVEL-1 TRAUMA CENTER
Erica Carney, Nick Evans, Monica Gaddis, University of Missouri-Kansas City School of Medicine, Kansas City Fire Department CATEGORY OF SUBMISSION: DISASTER

Background: Merriam Webster defines disaster as “a sudden calamitous event bringing great damage, loss, or destruction.” Hospitals nationwide train for disaster response. Never has this training been more important given the uptick in mass casualty events. Knowledge of some key information was less than optimal. This information included knowledge of ventilator availability, and locations and knowledge was <40% correct in these areas. Resident training year was not associated with test score (p = 0.104). Only 15.4% of physicians felt well prepared for a mass casualty event.

Methods: This was a retrospective data collection from a hospital’s critical care unit and pediatric critical care unit. Knowledge of some key information was less than optimal. This information included knowledge of ventilator availability, and locations and knowledge was <40% correct in these areas. The preferred t-test and analysis (Tukey). Results: The response rate of tested individuals was 100%. Residents scored 54.8 ± 13.4 points on 11 knowledge based questions. Staff physicians scored 67.8 ± 15.1 points (p = 0.014). Knowledge of some key information was less than optimal. This information included knowledge of ventilator availability, and locations and knowledge was <40% correct in these areas. Resident training year was not associated with test score (p = 0.104). Only 15.4% of physicians felt well prepared for a mass casualty event.

Conclusions: Although ED residents and staff physicians receive more training than other specialties, there is a need for improvement on disaster response knowledge. Also, because of no or limited training outside of the Emergency Department, disaster response knowledge may be even lower hospital-wide. Additional training and resources could help better prepare this hospital to deal with a mass casualty event. While this was a single site assessment, disaster planning and education and resultant knowledge may also be limited elsewhere.

163. PEDIATRIC MASS CASUALTY TRIAGE ALGORITHMS: A COMPARATIVE STUDY ANALYZING SPEED, ACCURACY, AND INTER-RATER RELIABILITY
Katherine Staats, Tabitha Cheng, Nicole A’Arcy, Kian Niknam, J. Joelle Donofrio, Stanford University, Department of Emergency Medicine CATEGORY OF SUBMISSION: DISASTER

Background: Multiple algorithms exist to rapidly triage children during mass casualty incidents (MCIs), but there is still no consensus on which algorithm should be used. The ideal MCI algorithm would have high inter-rater reliability, be able to be used accurately, and would not require much time to perform. Methods: This was a pediatric tabletop study utilizing prehospital providers (EMTs/paramedics) to compare 6 methods of pediatric MCI triage: pediatric Simple Treatment And Rapid Transport (JumpSTART), modified JumpSTART, Pediatric Triage (8), Pediatric Triage Transport (8), CareFlight (CF), and SALT. A total of 28 providers were split into 6 groups, given a scripted session on the specific algorithm they would use in the study, and then were provided a solo timed tabletop disaster with a defined set of 25 pediatric trauma cases. Triage denials for each patient and time to completion of triage (minutes) were collected. Providers’ under-triage (UT), over-triage (OT), and overall accuracy in use of the algorithm were reported as means, with the overall inter-rater reliability between algorithms presented with kappa scores. Results: There were 65/28 providers per group. Rates of provider UT, OT, and accuracy varied widely with UT ranging from 24.1% (STM) to 100% (SALT), OT from 7.0% (NA) to 25.5% (PTT), and accuracy 67.8% (PTT) to 89.4% (STM). The inter-rater reliability kappa was moderate for PTT (0.56) and SALT (0.60); substantial for CF (0.56), NA (0.69), and JumpSTART (0.74), and almost perfect in STM (0.81). The 3 quickest algorithms for providers to perform were CF, SALT and NA (<4:30) followed by JumpSTART and PTT with PTT and STM the slowest at ≥0:80:00. Conclusions: This study demonstrates the challenges inherent to optimizing triage systems. We saw that as accuracy and kappa are improved, the speed of an algorithm slows (STM). The faster algorithms are JumpSTART, the less precise the designations are: the 3 quickest algorithms were 3 of the 4 least accurate (CF, SALT, and NA). In this study, NA and JumpSTART were the 2 MCI triage systems that demonstrated a balance of the qualities crucial for the ideal pediatric triage algorithm.

164. EPIDEMIOLOGY OF PREHOSPITAL CARE AT THE SAN DIEGO-TIJUANA BORDER CROSSING
Jennifer Farah, Mathew Goebel, Jodie Pierso, J. Joelle Donofrio, UC San Diego Department of Emergency Medicine, Chula Vista Fire Dept, San Diego Fire-Rescue Paramedic Program CATEGORY OF SUBMISSION: MEDICAL

Background: San Diego has the busiest international land border crossing in the world. The epidemiology of prehospital care at the San Diego-Tijuana border crossings was previously unreported. Investigators sought to describe prehospital care provided at the San Diego border crossings. Methods: This was a retrospective data collection from 2014 to March 2017 evaluating prehospital provider (PHP) contacts at one of 2 border addresses. The 9-1-1 dispatch center and first response were prehospital providers. The non-emergency care. Knowledge and perceived personal error rate and the ease of use, perceived stress reduction, and perceived potential for error reduction by the color-only method. Continuous outcomes (time to completion, percent errors) between the color-only and validation methods were compared using Wilcoxon signed rank test for paired means and McNemar test for paired differences with distribution-free 95% confidence intervals was calculated. Results: The preferred 3 kg calculations had a median time of 55.6 seconds, a median time to completion of 56.6 seconds, and critical errors occurred in 8/20 trials. The color-only method took less time to complete than the validation method (p = 0.014). There were no statistically significant differences in accuracy and time to medication administration between the color-only method and the validation method. Use of a color-coded syringe did reduce time to medication administration when compared to a preferred method and an FDA-approved validation method.

165. EFFECT OF PREVIOUS EMERGENCY PSYCHIATRIC CONSULTATION ON SUICIDE ATTEMPTS ON THE RESULTS OF CURRENT EMERGENCY DEPARTMENT VISITS DUE TO SUICIDE ATTEMPTS: A MULTICENTER OBSERVATIONAL STUDY
Son Jeong Min, Jeong Joo, Song Yong Ju, Ro Young Sun, Shin Sang Do, Hong Ki Jeong, Park Jeong Ho, Kong So Yeon, Sun Kyung Min, Choi Sae Won, Kim Yu Jin, Kim Sola, Kim Tae Han, Hong Won Fyo, Sohn You Dong, Department of
Background: The previous suicidal attempt has known to be the greatest risk factor for successful suicide. Emergency department (ED) is one of the first gateways when suicidal patients seek health care services. Few studies were reported on the effect of emergency psychiatric consultation for suicidal re-attempts. This study aimed to prove the hypothesis that people who received emergency psychiatric services in previous suicide attempts will have a lower mortality rate in current ED suicidal re-attempts. Methods: This is a cross-sectional study using an emergency department injury surveillance system database. From January 2007 to December 2016, 6803 patients visited 6 emergency departments due to suicide re-attempts from January 2007 to December 2016 were analyzed. The main exposure was previous emergency psychiatric consultation (EPC) defined whether positive treatment was given in previous suicide attempts. The outcome was hospital mortality including death-on-arrival, emergency department death, and death within 24 hours. Secondary outcome was selection of fatal suicide method defined as Columbia Suicide Severity Rating Scale (C-SSRS) and the case fatality rate. Potential confounding variables were age, gender, alcohol consumption, previous emergency psychiatric consultation. Multivariable logistic regression analysis was used to determine the association between the main exposure and outcomes. Results: A total of 1,821 suicide re-attempters with previous suicide attempts histories were analyzed; 1,062 positive EPC and 759 negative EPC patients. Hospital mortality was significantly different between positive EPC (n=34, 3.2%) and negative EPC (n=45, 6.3%) (p<0.01). The positive EPC group looked to select non-fatal suicide methods such as drug overdose, while negative EPC group was more likely to select fatal suicide methods such as hanging, poisoning, and gas inhalation (p<0.01). AOR (95% CI) of positive EPC was 0.52 (0.32–0.83) for hospital mortality and 0.37 (0.30–0.47) for selection of fatal suicide method. Conclusions: Suicide re-attempters who had received an emergency psychiatric consultation for the previous suicide attempt showed lower hospital mortality, which was likely due to their selection of non-fatal suicide methods for current suicide attempt. Emergency medical services destination protocol for suspected suicide patients should consider the capacity of emergency psychiatric consultation of the hospital.

166. SIMULATION TRAINING AND EMS COMFORT WITH PEDIATRIC PATIENTS

Daniel Joseph, Lucas Butler, Mark Cicero, Megan Lavoie, Khoon-Yen Tay, Travis Whiffal, Marc Auduch, Yale Department of Emergency Medicine. Section of EMS CATEGORY OF SUBMISSION: PEDIATRIC

Background: Critically ill pediatric patients are some of the most challenging encounters for prehospital providers. These cases are infrequent for EMS, and limited experiences and variations in physiology, vital signs, and drug dosages may predispose to errors. The aim of this study is to describe the availability of pediatric simulation-based training and explore the association of exposure to simulation with provider confidence. We hypothesized that EMS provider exposure to simulation would be correlated with higher confidence in caring for critically ill pediatric patients. Methods: This was a survey of prehospital providers in Pennsylvania (August 1, 2015–December 31, 2015) and Connecticut (June 1, 2017–July 15, 2017) at 2 statewide EMS convener lists for EMS providers. The survey included 3 sections: comfort with 23 pediatric skills on a 5-point Likert scale (1=very uncomfortable 5=very comfortable), 16 questions related to pediatric training (requirements, faculty, frequency, instructional design, satisfaction) and 4 demographic questions (email distribution). Provider comfort was defined as a likert scale of 4 or 5. Results: A total of 233 respondents participated in this study: 45% were EMTs, 42% were paramedics, and the remainder were PHRN. A total of 36% of respondents reported exposure to simulation. Providers were most comfortable with procedures such as administering oxygen, maintaining cervical spine precautions, and transporting children properly secured in an ambulance (95, 91, and 85%, respectively). They were least comfortable with procedures more unique to pediatrics such as stabilizing a patient with increased ICP, managing a child with special healthcare needs, and pediatric airway management (39, 47, and 54%, respectively). A total of 55% of providers felt that their pediatric training was adequate for the management needs. Providers with simulation training were significantly more likely to feel adequately prepared to care for pediatric patients (68% vs. 53%) (p<0.001). Simulation exposure was particularly associated with higher comfort with pediatric intubation (73% vs. 34%, p<0.001), pediatric intraosseous line placement (82% vs. 55%, p=0.002), and pediatric hemorragh control (92% vs. 75%, p=0.002).

Conclusions: Pediatric simulation training is associated with improved confidence and comfort among prehospital EMS providers. Further studies are needed to see if simulation exposure improves outcomes and reduces error.

167. CERVICAL SPINE MOTION DURING PRE-TO IN-HOSPITAL TRANSFER OF CARE DELAYS INDUCED BY VOLUNTARY MOVEMENT IN PATIENTS WITH SUSPECTED SPINE INJURY

Neil McDonald, Rob Pryce, Erin Weldon, Dean Kriellaars, University of Winnipeg CATEGORY OF SUBMISSION: TRAUMA

Background: In some jurisdictions, there can be substantial delays between the time of ambulance arrival at an emergency department and the transfer of patient care. In remote settings, a significant proportion of seriously injured patients are transported to a tertiary trauma center. First responder teams treat the patient until HEMS arrives. First responder teams capable of providing advanced life support (ALS) and providing a higher level of care to the seriously injured, by performing lifesaving interventions that are beyond the scope of practice of basic life support providers. The goal of this study was to validate the benefits of ALS first responder management prior to HEMS transport of the patient. Methods: This is a 2-year retrospective review of the Texas Trauma Service Area P regional trauma registry. All patients transported to a Level 1 trauma center by HEMS were included. Patients were dichotomized based on the first responding agency level, ALS or basic life support (BLS). Patient acuity was stratified by Injury Severity Score (ISS). The primary outcome was overall survival. Secondary outcomes were hospital length of stay (LOS) and ICU LOS. Fisher exact test was used for categorical data, and t-test was utilized for continuous data, statistical significance was considered significant p value ≥0.05. Results: A total of 561 patients were transported to a Level 1 trauma center by HEMS. Of these, 513 (87%) were initially treated by an ALS provider for the presence of the cervical collar was 12.8+/–10.7 (95% CI: 12 to 14). The mean ISS of the ALS cohort was 12.8+/–10.5 and the mean ISS of the BLS cohort was 13.1+/–12.6. There was no difference in ISS greater than 25 between the 2 groups (2% vs. 1%). There was a significant survival benefit 92% (475/513) vs.
TRENDS IN UTILIZATION OF A STATEWIDE ALS SYSTEM WITH PREDICTION MODELS OF FUTURE USE

Michael Carr, Mark Merlin, Robert Bauter, Naree Arjintaranon, Ammudeep Tagore, Jim Tanis, Janae Hohbeen, Joslyn Joseph, Michael Carr, Mark Merlin, Robert Bauter,

Background: In this study, we aimed to trend patterns of utilization in an EMS system to identify the needs of a growing population and to allow for better understanding of how the EMS system is being used. The objectives of this study were to evaluate all call volume, EMS transportation, and frequency of chief complaints. Using this information, we developed a prediction model that showed how our EMS system will be used in future years.

Methods: A retrospective epidemiologic survey of emergency medical services (EMS) system data was performed. We extracted system data using the electronic medical record (EMR) of the 9-1-1 system, and computer-assisted dispatch (CAD) database between 2010 and 2017. The 9-1-1 utilization, call volume, transport, EMS system utilization, and ALS cancelled rates were calculated and trended over the study period. Utilization based on call type was also recorded and trended. The methods of prediction were assessed through linear forecasting to determine future utilization of call volume.

Results: The annual 9-1-1 call volume increased by 34.3% with an annual average increase in call volume of 4.43%. The captured population of the catchment area increased by 1.37%. The 9-1-1 utilization rate (calls per 1,000 people grown from 57 calls per 1,000 people (22.4% increase) with an average annual increase of 4.23%). The total number of patients transported to the hospital increased from 47 per 1,000 people to 1,000 per year (21.4% increase) with an average annual increase of 4.67%. Prediction models were applied, and utilization was trended up to 2021 which demonstrated a consistent, dramatic increase of 9-1-1 use for the next 4 years. Conclusions: We demonstrated an overwhelming increased use of and a possible increased future burden on our 9-1-1 EMS response system. There is an urgent need for alternative pathways to care in our system which relies heavily on EMS transportation to hospitals for trauma, treatment, and management.

VALIDATION OF A PALLIATIVE OR END-OF-LIFE CARE CASE-FINDING MEASURE IN EMERGENCY MEDICAL SERVICES

Alix Carter, Michelle Harrison, Judah Goldstein, Marianne Arub, Barbara Stewart, Jan Jensen, Edward Dent, Susan Amundson, Nova Scotia & Dalhousie University, Division of EMS Category of Submission: Operations, Quality, Safety Systems

Background: The novel Paramedics Providing Palliative Care at Home program has been developed to address the mismatch between traditional paramedic practice and patient’s goals of care. Case-finding is key to estimating potential impact for EMS looking to establish such programs, continuous quality improvement once operational, and for prospective identification of patients who might benefit from a palliative care approach.

Methods: A priori Gold Standard criteria for determining whether a response was appropriate for a paramedic palliative care approach were identified by expert consensus. Excluding chief complaints and clinical conditions that were universally identified as not appropriate for paramedic palliative care support, these criteria were applied by 2 trained chart abstractors to 500 consecutive charts to classify calls as appropriate for paramedic palliative care support, or not. The PSCM and modifications (added criteria call location type and registration in a palliative care program, test mining terms) were applied to the same data set.

Results: Of the 500 cases, 21 (4.2%) were classified as appropriate for paramedic palliative care support using the Gold Standard (kappa = 0.73). 9 cases with initial disagreement were reviewed with 8 ultimately being deemed to fit the palliative support criteria. To match with medical poorly (using the “potential palliative” cut point): sensitivity 74.1% (95% CI: 47.8-88.7), specificity 71.4% (95% CI: 67.1-75.4) and PPV 9.9% (95% CI: 4.2-19) and Negative Predictive (NPV) of 99.3% (95% CI: 96.7-99). The modified PSCM: sensitivity 61.9% (95% CI: 38.4-81.9), specificity 99% (95% CI: 97.6-99.7), PPV 72.2% (95% CI: 50.5-86.9), and NPV 98.5% (95% CI: 97.2-99). A Modified PSCM plus palliative term performed similarly: sensitivity 100% (83.9-100), specificity 97.3% (95% CI: 95.4-98.5), PPV 61.8% (95% CI: 46.6-73.4), and NPV100%. Conclusions: A modified PSCM provides moderate sensitivity, specificity and PPV, improved by the text term Pall* if feasible. This query will be helpful to systems considering a paramedic palliative care program or when.

EMERGENCY MEDICAL SERVICES RESPONSE TO THE ROHINGYA REFUGEE CRISIS IN BANGLADESH

Saman Kashani, Sam Decon, Parveen Parmar, Steve Sanko, Marc Eckstein, Meredith Walsh, Keck School of Medicine of USC, Department of Emergency Medicine Category of Submission: Disaster

Background: We aim to describe the experiences of Hope for Bangladesh (HF), an EMS provider in response to the Rohingya Refugee Crisis near Cox’s Bazaar, Bangladesh. The Rohingya people have now become the world’s largest stateless population. The largest “mega” camp is estimated to be home to 954,000 refugees. While numerous humanitarian agencies have established field hospitals, there is no comprehensive medical transport system, staffing, training, documentation or dispatch algorithms for those agencies with ambulances.

Methods: There are 3 HF ambulances which are staffed with Bangladeshi midwives, available from 0800 to 1700hrs daily. Overnight transport is provided by a handful of motorized rickshaws. Descriptive statistics of the patient population, reason for transport, transport destination, and patient’s camp were retrospectively collected from March to May 2018. HF ambulances are primarily available in the mega camp that serves a population of approximately 700,000 refugees. Ambulances were active prior to this time being done. Results: HF ambulances transported 167 unique patients to 22 facilities. Of the 167 patients, 100 (60%) were female. The median age was 22 years (range 20-80) and 31 patients (18.6%) were less than 1 year old of which 13 (42%) were newborns. Obstetric emergencies and trauma were the most common reason for transport, each accounting for approximately 13% of call volume, followed by respiratory distress (8.4%), musculoskeletal problems (7.2%), abdominal pain (6.6%), fever (5.4%) and neonatal distress (4.8%). Acute watery diarrhea, malnutrition and mental health crises each accounted for approximately 5% of transports. 30% of transports were for non-emergent chief complaints, which require an ambulance because refugees may not leave the camps without a formal medical referral. Patients were most commonly transported to Médicins Sans Frontières (MSF) Field Hospitals (29.9%), followed by the local district hospital (25.4%) and the Hope Foundation Hospital for Women (15.6%). Conclusions: This is the first description of the EMS response to the Rohingya refugee crisis. While data collection was challenging, these results may be used to focus provider training, identify gaps in care, and to improve both emergent and non-emergent referral mechanisms.
Background: In emergent medical situations, there are limited alternatives to ambulance or Emergency Department (ED) visits, particularly during off hours. This is magnified in skilled nursing facilities (SNFs) where many of these visits are unnecessary and avoidable. Objective: The objective of this study is to examine the efficacy of an Emergency Telemedicine Service staffed by Emergency Medicine physicians supported by embedded/on-site Clinical Care Specialist (CCS) technicians (specialized EMT/P). Patients were trained to activate the Emergency Telemedicine Service in the same manner they would use to call the patient’s physician in an emergency. Patients were evaluated and treated bedside by the Emergency Telemedicine Service Physicians in conjunction with the SNF staff and the onsite CCS. Patient care included, but was not limited to, a standard history and physical, bedside diagnostic testing and medication administration when necessary. Key quality metrics, including chief complaint, hospital transfer avoidance rates and relevant clinical outcomes were analyzed from July 1, 2017, and June 30, 2018. Descriptive statistics as well as confidence intervals and interquartile ranges were calculated using Microsoft Excel. Results: During a one-year period, 4,088 patients were seen by the Emergency Telemedicine Service. 67.8% (CI: 66.3-69.2%) of patients were treated in the SNF and avoided transports to the ED by EMS (36.89% vs. 27.6%) of patients were transferred to the ED. The median response time by a physician was 8 minutes (IQR 3–15 minutes). Conclusions: Through the use of an Emergency Telemedicine Service, a high proportion of patients tradition- ally transported to the hospital for emergent medical conditions were treated in the SNF itself, thereby reducing EMS activations and ED visits. Further investigation should focus on establishing the scope of practice, cost savings, and integration of EMS with Emergency Telemedicine Services.

174. EARLY DOUBLE SEQUENCE DEFIBRILLATION IMPROVES SURVIVAL TO THE EMERGENCY DEPARTMENT IN 22%

Andrew Parrish, Mark Merlin, Navin Ariyaparki, Ammundee Tagore, Alex Over, Jim Tanis, Janae Hohbein, Joslyn Joseph, Matt Stur, Sreemukti Sengupta, Medical Center MDCOM EMS CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: In 2016, our EMS system, located in New Jersey, implemented a double sequence protocol to utilize double sequence defibrillation after single shocks from any source, including AEDs, RVA, and ALS, which failed to regain spontaneous return of circulation. Our 2-tier, double medic system is in an unique position to test early double sequence defibrillation as each ALS unit is equipped with both a Physio-Control LifePak 15 and a LifePak 12. Double sequence defibrillations (DSD) were performed using 2 LifePak monitors each shocking at 360 Joules, with both shock buttons pressed simulta- neously. Methods: We performed a retro- spective chart review from implementation of our DSD protocol utilizing double sequence defibrillation between 2016 to 2017. We identi- fied 105 cases of double sequence defibrillation use after single defibrillations over 2 full years. Cases of traumatic cardiac arrest (2 cases) or exsanguination causing cardiac arrest (one case) were excluded. All other causes of cardiac arrest, both witnessed and unwitnessed, were included. Results: 103 patients were included in analysis with a mean age of 65.8 +/- 14.4 years. All ages and pregnancy were included in our data collection. The cardiac arrest was witnessed in 38 cases (36.89%), bystander and the other had ACS. None of the 42 activations to access a military facility are also reported. Results: There were 42 EMS activations for a patient with a medical emergency presenting to our MTF. Most time delay from EMS activation until patient delivery to the Emergency Department was 12.2 minutes. Of the 42 activations, 10 had a complaint concerning a time-sensitive condition. Two were diagnosed with time-sensitive condi- tions. One had an ischemic cerebral infarct and the other had ACS. None of the 42 activations resulted in a complaint. The only complaint that resulted in a complaint was the lack of bystander CPR and was associated with significant early defibrillation and early ROSC with survival.

176. DELAYS IN CARE AT A STATESIDE MILITARY TREATMENT FACILITY: BALANCING PATIENT CARE AND FORCE PROTECTION

Sean Nardi, Brian Ferguson, Sean Peck, Elliott Ross, Benjamin Walrath, Naval Medical Center San Diego CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Patients suffering from time- sensitive medical emergencies, such as myocardial infarction, stroke and traumatic injury have better outcomes when they receive timely treatment. Military medical treatment facilities (MTF) must balance the desire to optimize the care of the patient with force protection. At our facility, current protocols mandate the activation of the Emergency Medical Services (EMS) system to respond and evaluate a patient at the gate with certain access privileges. If emergency treatment is warranted, the patient is then transported to the Emergency Department for care and treatment. This study reviewed EMS activations related to use of this protocol and associated time-sensitive patient conditions they occurred, whether they have been working in the care. Methods: We retroreviewed EMS runs from January 1, 2017 to November 12, 2017 to hospital access points to assess patients who were denied access to the MTF. Time from EMS activation until delivery at the Emergency Department and number of time-sensitive complaints are reported. Time sensitive complaints were defined as chief complaints associated with myocardial infarction, stroke, traumatic injury, or abnormal presenting vital signs (HR >100, SBP <90 or >210, RR <6 or >30, SpO2 <90%). Number of cases per week, number of attempts to access a military facility are also reported. Results: There were 42 EMS activa- tions for a patient with a medical emergency presenting to our MTF. Most time delay from EMS activation until patient delivery to the Emergency Department was 12.2 minutes. Of the 42 activations, 10 had a complaint concerning a time-sensitive condition. Two were diagnosed with time-sensitive condi- tions. One had an ischemic cerebral infarct and the other had ACS. None of the 42 activations resulted in a complaint. The only complaint that resulted in a complaint was the lack of bystander CPR and was associated with significant early defibrillation and early ROSC with survival.

Conclusions: During our 11 month period of
A cross-sectional study of STPs utilization of venous lactate levels in the prehospital setting

Matthew Steenberg, Michael Berkenbush, Austin Jeong, Seung Chul Lee, Rachel Siegel, Won-Ho Jeong, Seung Chul Lee, Department of Emergency Medicine, Seoul National University Hospital CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: Asthma is a prevalent disease process, affecting over 8% of adults and children and a leading cause of the management of acute asthma exacerbations. The administration of nebulized medication is not included in the national EMT scope of practice model, but is included for Paramedic level providers. The purpose of this investigation is to describe the overall prevalence of Statewide Treatment Protocols (STPs) that allow for basic life support (BLS) nebulizer administration of bronchodilators in asthma protocols.

Methods: Cross sectional study of STPs utilizing a standardized review examining asthma, wheezing or respiratory distress protocols for inclusion of BLS administration of nebulized bronchodilators. Protocol revision date was also captured. Results: Thirty out of 50 (70%) states issue BLS STPs, 24 of which are mandatory, while the remainder serve as guidelines. Of the 24 states that issue mandatory BLS STPs, only ten (42%) include albuterol nebulizers as an approved medication. Four (16%) of the states that issue mandatory BLS STPs allow for BLS bronchodilator administration. Pediatric administration is allowed in 9 (38%) of the mandatory protocols of the STPs that have been revised since 2015. Conclusions: Bronchodilators are a life-saving mainstay for the treatment of asthma and bronchospasm. Early administration of bronchodilators nebulizers would allow the initiation of treatment at an earlier point with relatively low risk of adverse effect to the patient. The National Scope of Practice does not allow for BLS administration of nebulized bronchodilators but almost half of states with mandatory protocols allow for administration. The large majority of protocols have been revised within the past 3 years, demonstrating that out-of-date protocols are unlikely to be the cause of this limitation. Further investigation is needed to examine obstacles to including bronchodilator nebulizers in BLS STPs and consideration for inclusion in the National Scope of Practice Model.

178. USE OF VENOUS LACTATE LEVELS IN THE PREHOSPITAL SETTING

Brian William Walsh, David Feldman, Matthew Steenberg, Michael Berkenbush, Danielle Biggs, MorrisMann Medical Center CATEGORY OF SUBMISSION: MEDICAL

Background: Sepsis protocols have been developed in Emergency Departments to identify and treat patients quickly. It follows that identification of septic patients in the prehospital setting would provide additional benefit. Methods: Setting: A suburban, hospital-based, 2-tiered EMS system in which the Advanced Life Support providers treat about 25,000 patients annually. All patients have online medical control. Subjects – Consecutive patients in whom a venous lactate level was obtained in the prehospital setting. We sought to describe our initial experience and to determine the utility of its use by patient demographic and adverse events. Results: A total of 2,295 patients had lactates drawn. The average age was 75 and 48% were male. Of all the patients with lactates drawn, the average lactate level was 136, DBP was 80, heart rate was 92, and respiratory rate was 20. 56% (CI: 54, 58) of the lactates were elevated above 2.0. Those with elevated lactates were given an average of 432 ml (CI: 381, 484) of normal saline IV, and those with normal lactates were given an average of 370ml (332, 408) (Difference: 62, (CI: -2, 125) p = 0.0562). Conclusions: Over half of prehospital lactate levels drawn would be considered useful in treating a patient with potential SIRS/sepsis. This lactate testing did not result in additional treatment prehospitali, and it is unclear if the results had an effect on treatment in the ED or patient outcomes.

179. INTERACTION EFFECT OF ENDOTRACHEAL INTUBATION AND PREHOSPITAL TIME INTERVAL ON NEUROLOGIC RECOVERY IN OUT-OF-HOSPITAL CARDIAC ARREST

Ki Hong Kim, Sang Do Shin, Young Sun Ro, Kyung Sun Kim, Soon Chul Lee, Department of Emergency Medicine, Seoul National University Hospital CATEGORY OF SUBMISSION: CARDIAC

Background: Prehospital advanced airway management (AAM) or has been a serious controversial issue in cardiopulmonary resuscitation (CPR) by emergency medical service (EMS) providers in out-of-hospital cardiac arrest (OHCA). Early endotracheal intubation (ETI) can disrupt the continuous CPR and followed by defibrillation while late ETI can limit the enough oxygenation to the OHCA patients. This study was conducted to evaluate the interaction effect of prehospital ETI with prehospital time interval (PTI) for CPR at the scene on neurologic outcome in OHCA. Methods: A nationwide cross-sectional observation study was conducted. Presumed OHCA patients were enrolled. OHCA were categorized into 2 groups: endotracheal intubation (ETI) vs. supraglottic airway (SGA). Primary outcome was survival and secondary outcome was good neurological recovery. Multivariable logistic regression analysis was conducted to calculate adjusted odds ratios (AOR) with 95% confidence intervals (CI) by ETI versus SGA on outcomes. Results: The final analysis included a total of 16,105 eligible patients (ETI 2,320, SGA 13,783). The survival rate was 7.6% (ETI 6.9%, SGA 7.7%) and good neurologic recovery was 4.7% for all [ETI 3.8%, SGA 4.8%]. There were no significant differences (AOR and 95% CI) by ETI in multivariable logistic regression analysis compared with SGA; 0.81 (0.63-1.05) for survival to discharge and 0.92 (0.76-1.12) for good neurologic recovery. In interaction analysis between prehospital AAM type and ETI, ETI showed favorable main outcomes than SGA in longer (>30min) PTI, ETI 6.9%, SGA 7.7%, p<0.05. Good neurologic recovery 1.37 (1.12-1.68). Conclusions: AAM type (ETI and SGA) was not associated with better outcomes for OHCA patients. This study was conducted to evaluate the interaction effect of prehospital ETI with prehospital time interval on outcomes. However, the prehospital ETI was significantly associated with higher odds of survival and good neurologic recovery for OHCA patients with over 30 minutes or longer prehospital intervals.
Conclusions: Significantly fewer visits in the 180 days following visits at 90 days, CP patients had significant exacerbation. Further study is needed to determine which patients actually benefit from ALS intercept, guiding future training and dispatch guidelines at the BLS and ALS levels of care.

181. COMMUNITY PARAMEDIC POST-DISCHARGE PROGRAM: REDUCING THE COST OF CARE AFTER HOSPITALIZATION
Tia Radant, Paula Miller, Ann Majerus, Jennifer Murphee, Adam Mayer, Sandi Wewerka, John Clark, Aaron Burnett, Regions Hospital EMS CATEGORY OR SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: A private hospital established a Community Paramedic (CP) program for patients discharged from the hospital with an acute exacerbation of congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD). This program aimed to improve appropriate healthcare utilization and reduce readmissions in this population, thereby reducing overall cost of care. Objectives: The objective of the study is to quantify the impact of a post discharge CP program on the rate of healthcare utilization and estimated healthcare cost savings during the 90 and 180 days following hospitalization for patients admitted with an acute CHF exacerbation. Methods: Local area resident, English-speaking inpatients with CHF who did not have home-care services at discharge were offered visits by a CP for up to 30 days post-discharge. Patients who consented had a CP visit them in the home 1–2 times per week for 4 weeks following discharge. Healthcare utilization was analyzed descriptively using means and standard deviations and was compared to a population not receiving CP visits using Wilcoxon rank sum tests. Cost data was calculated using expected cost per day and average length of stay for patients in control group of CHF and COPD patients. Results: A total of 115 patients enrolled between February 2015 and June 2018. As of July 2018, 50 patients had completed the program with complete data. Compared to control patients, CP patients had significantly fewer hospital admissions during the 90 days (p = 0.0265) and 180 days (p = 0.0311) following completion of CP visits, corresponding to an estimated cost difference of $476,000 over 180 days. Though there was no difference in emergency department visits at 90 days, CP patients had significantly fewer visits in the 180 days following CP visit completion (p = 0.0486), corresponding to an estimated cost difference of $31,000. There was no significant difference in clinic visits during the 90 and 180 days following completion of CP visits between the 2 groups. Conclusions: Home visits by a CP for 4 weeks following hospitalization can be successful in reducing readmissions and ED visits and reducing healthcare costs for patients with CHF and COPD. These results suggest the potential of system-wide cost savings through implementation of a CP program.

182. 9-1-1 EMERGENCY MEDICAL SERVICES REKINDLES IN THE CITY OF LOS ANGELES
Stephen Sanko, Marc Eckstein, Keck School of Medicine of the University of Southern California CATEGORY OR SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: A “rekindle” is an industry term for a patient requiring a second EMS response in the same calendar day, and is a desirable safety metric that is unfortunately hard to track due to the limited ability of 9-1-1 agencies to perform patient matching or bill for non-transport. The objective of this study was to look at the prevalence and characteristics of patients with 9-1-1 rekindles in the City of Los Angeles. Methods: This was a retrospective, descriptive study of electronic encounter records for the Los Angeles Fire Department (LAFD) for cases occurring between January 2012 and July 2017. Patients were included if they had sufficient data to assign a Patient ID number (PIN), which required both 2 or more transports in a calendar year as well as the presence of at least 2 of the following data elements on each encounter: social security number of birth, patient pin or address. Critical rekindles were defined as a second EMS response on the same calendar day of service where on the second encounter the patient was marked “252” criteria as defined by the Centers for Medicare and Medicaid Services or they were found dead on arrival. The primary endpoint was the prevalence of critical rekindles. Results: Among the 2,062,069 EMS incidents occurring during the study period, 602,632 (29%) included a patient for whom a PIN could be assigned: 104,530 of these incidents resulted in a non-transport; and 7120 (1%) resulted in a same-day rekindle. This rekindle rate increased from 0.6% in 2012 to 2.5% in 2017. There were 58 critical rekindles during the study period (0.006% of incidents and 0.04% of all rekindles), and the rate of critical rekindles remained stable over time. Critical rekindles had an average age of 67.1 years (IQR 55–76 years), were 53.8% male, tended to have multiple comorbidities and frequently occurred following vague initial encounter complaints (such as weakness or flu-like symptoms). Conclusions: In this limited data set from a large urban 9-1-1 EMS provider, rekindles in 1-1 patients initially released on scene were found to occur at rates similar to those published for emergency departments.

183. QUALITATIVE ASSESSMENT OF PEDIATRIC EMERGENCY CARE COORDINATORS AND SKILLS COMPETENCY VERIFICATION IN EMS AGENCIES
Manish Shah, Rachael Alter, Carolina Roberts-Santana, Angela Poorman, Margo Knellkamp, Hilary Hewes, Sarah O'Donnell, Samuel Vance, Baylor College of Medicine CATEGORY OR SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Ensuring EMS providers are equipped to care for children is challenging. National recommendations propose EMS agencies have pediatric emergency care coordinators (PECC) to promote education, improve processes, enhance protocols, and ensure supply availability for children. This and having process for providers to demonstrate competency using pediatric-specific equipment were identified as a gap in the national pediatric emergency medical services (EMSC) program has recently assessed. Purpose: The purpose of this study was to identify practices from EMS agencies in several states that have a PECC program or a method of verifying skills competency with pediatric-specific equipment. Methods: This was a qualitative health services study of EMS systems in 6 states. EMSC-based interviewers identified systems representing various geographic, urban-rural and administrative structures that had a PECC or skills competency verification process. They contacted EMS agency administrators to conduct phone-recorded, semi-structured interviews to assess current practices in their systems. Interviews were transcribed, and 2 investigators used constant comparison analysis to code themes until saturation was reached. Results: Several themes emerged from the 17 interviews. Three were identified about the PECC: roles and responsibilities; staffing model; and impact. All PECC’s focused on quality improvement, and most had pediatric-specific roles in education promotion, supply oversight, community collaboration, and protocol review. Most PECCs were full-time EMS agency paramedics or physicians, and many had responsibilities integrated into existing roles. The PECC’s main benefit was enhancing provider confidence with pediatric patients, while the primary challenge was insufficient time fulfilling the role’s responsibilities. Four themes for physical demonstration of competency using equipment were: training process; equipment items; personnel needed; and impact. Most agencies reported hands-on skills verification or observation periods instead of didactic trainings to increase staff competence. Most have their medical director present, and demonstrating equipment use identified ways to improve. Conclusions: EMS agency administrators identified promising practices that their systems implemented to have a PECC or skills competency verification process. They identified the primary benefit of both as enhancing provider confidence with pediatric patients. Future research should focus on measuring patient-centered outcomes in having a PECC and skills verification processes, and identifying practical ways to overcome the barriers to having them.

184. FADE TO BLACK: AN ANALYSIS OF THE EVOLUTION OF BATTLEFIELD EPIDEMIOLOGY AND TACTICAL COMBAT CASUALTY CARE BETWEEN TWO OF AMERICA’S CONTEMPORARY CONFLICTS
Robert Gerhardt, Kris Filak, Robert Mabry, Department of Emergency Medicine, UT Health San Antonio CATEGORY OR SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Compare and contrast U.S. battle casualty epidemiology and outcomes between engagements in Mogadishu 1993 ("Black Hawk Down") and Sadr City 2004 ("Black Sunday"), respectively. Identify episodes of successful knowledge translation and enduring capability gaps. Methods: Retrospective case series with meta-analysis of all U.S. battle casualties sustained during both engagements. Results: Both populations were comparable in terms of demographics, mechanism of injury and epidemiology. Of 26 fatalities, 19 (73%) were high-velocity penetrating trauma to the head, aortic or coronary injury, hemi-section. Seven (27% of fatalities, 3.5% of casualties) were adjudicated potentially survivable. After stratification, the case fatality rate for Mogadishu was 14% vs. Sadr City 11.1% (OR 1.35, CI: 0.51–3.6), potential survivable 28% vs. Sadr City 25% (OR 1.15, CI 0.13–11.84). All potentially survivable deaths (both cohorts) were associated with uncompromised torso or junctional hemorrhage and unavoidable delays in extrication and evacuation. No fatalities in either cohort were associated with airway obstruction, emergency medical care
intrathoracic tension or compressible extremity hemorrhage. Conclusions: Despite 10 years of preparing, both populations experienced comparable battle casualty rates, mechanisms of injury and primary wound types, and both had similar rates of potential life-saving interventions. Underestimating the trend toward lower case fatality and potentially survivable deaths was coincidental to full application of TCCC guidelines. And, permissive-hypotensive resuscitation. Non-compressible hemorrhage and traumatic coagulopathy remain primary contributors to potentially survivable battlefield death.

185. COUNTY-WIDE ASSESSMENT OF EMERGENCY MEDICAL SERVICES PROVIDERS’ RESEARCH AWARENESS AND INVOLVEMENT

Lauren Maloney, Scott Johnson, Robert Delagi, R Trevor Marshall, Department of Emergency Medicine, Stony Brook University Hospital. CATEGORY OF SUBMISSION: STUDENT, RESIDENT, FELLOW

Background: To assess the current state of research awareness through a county-wide survey of prehospital providers, and identify opportunities to improve the use of and participation in prehospital clinical research.

Methods: A 35-question survey containing demographic and experience items was beta tested and distributed to the county EMS system comprised of approximately 5,000 providers. Responses to various statements were graded on a 5-point Likert scale and analyzed with Chi square tests, p < 0.05 for significance.

Results: Of 1,000 responses, 120 were excluded (duplicate identifier, non-licensed provider level). Of 880 analyzable surveys, a majority of respondents were male (65%), and included paramedics (36%), EMT-Bs (45%). Mean age was 38 years with a mean of 13 years of EMS experience. 58% held college degrees, 44% subscribed to medical journals, and read articles a couple times a week (18%), month (38%), or year (32%). 87% disagreed spending 5 minutes to complete clinical trial paperwork was unacceptable. Providers most likely to frequently read research articles included paramedics (64% vs. 51% non-paramedics, p < 0.001) and college graduates (59% vs. 52% non-graduates, p = 0.043). Those who frequently read articles were more likely to agree more prehospital research would improve care prehospital care (94% vs. 87% who rarely read articles, p < 0.001). Those more likely to agree protocols should be based on clinical trial results included paramedics (88% vs. 78% non-paramedics, p = 0.019), and frequent article readers (85% vs. 79% infrequent readers, p = 0.015). Providers most interested in participating in clinical trials included paramedics (81% vs. 51% non-paramedics, p < 0.001), and frequent article readers (90% vs. 78% infrequent readers, p < 0.001). Providers most interested in attending journal clubs include paramedics (56% vs. 46% non-paramedics, p = 0.004), frequent article readers (59% vs. 38% infrequent readers, p < 0.001), and college graduates (44% vs. 30% non-graduates, p = 0.014).

Conclusions: In this cohort of EMS providers, awareness of and interest in participating in prehospital research was significantly higher in paramedics, than in non-paramedics, and frequent readers of journal articles. This highlights the importance of educating prehospital providers on fundamentals of research consent, and how to find, read, and evaluate medical research literature.

186. MEASURING EMS PERFORMANCE IN OBSTETRIC PREHOSPITAL CARE

Tobin Bader,Julianne Cyr, Jane Brice, Alik Carter, Department of Emergency Medicine, The University of North Carolina at Chapel Hill. CATEGORY OF SUBMISSION: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Essential to effective patient care is the accurate and complete documentation of prehospital interventions. Analysis of prehospital records advances improvement in patient care and provides opportunity for intervention through EMS education. The low-volume and high-risk nature of obstetric prehospital emergencies should prompt EMS systems to carefully monitor care of these patients. Objective: The goal of this study is to characterize performance for obstetric emergencies in North Carolina. Methods: NC EMS patient records between January and December 2013 were retrospectively reviewed. For pregnant or 6-week post-partum women ages 10-56 who were transported to a hospital by EMS. There were no exclusion criteria. Patient characteristics (age, race, obstetric emergency) and EMS performance measures (e.g. intravenous access, blood pressure measurement, newborn assessment) were assessed using descriptive and inferential statistics. Significance was set at 0.05. Results: Of 9,107 obstetric patients, 53% were Black/African American, 36% White, and 11% Other. Rural patients comprised 54%. Case classification was according to obstetric emergency, including “Pregnancy without delivery” (75%), “Vaginal bleed” (17%), “Miscarriage with bleeding” (3%), “Pregnancy with delivery” (2%), “Post-partum” (2%), and “Miscarriage without bleeding” (1%). Performance measures were consistently underreported during prehospital care (e.g. 45% IV success, 30% APGAR scoring, and 17% correct medication administration, where indicated by obstetric emergency). Significant differences in EMS performance were found by patient age, race, rurality, and obstetric emergency. Regression analysis showed IV placement was lowest for younger Black/African American patients receiving post-delivery care in urban counties (p < 0.05). Performance and documentation are dependent on the type of obstetric emergency and patient demographics. Performance measures were documented in fewer than 50% of cases. Reasons may include poor documentation or inconsistent application of protocols. New education for EMS personnel and improvement in protocol application are required to increase EMS skills and knowledge of these rarely encountered obstetric emergencies. Certain performance measures, such as early hospital notification, are not possible in prehospital documentation, providing limitations in EMS performance analysis.

187. SCENARIO-BASED PILOT TESTING OF EMS PROVIDER AWARENESS OF A NOVEL PEDIATRIC TRIAGE PROTOCOL

Jennifer Forest Anders, Jennifer Noel Fishe, Kyle Fratta, Johns Hopkins University. CATEGORY OF SUBMISSION: PEDIATRIC

Background: Pediatric care is increasingly concentrated in a small number of hospitals. No widely operative triage protocols guide EMS’ pediatric destination decision for non-trauma patients. The PDTree tool is an evidence based protocol developed to assist EMS providers’ in choosing a pediatric destination and triage of a non-trauma patient, by condition and emergency type. Objective: The objective of this study is to pilot test the PDTree tool with practicing EMS providers for accuracy of triage and emergency type. Methods: Maryana EMT providers volunteered in this online pilot testing. Participants were asked to read the PDTree tool and answer 14 patient scenarios. For each scenario, providers were asked to name their most likely destination, to indicate why they chose that destination, and to select the level of care suggested by the protocol. Results: Of 100 providers (52 advanced life support [ALS], 48 basic life support [BLS]) completed the electronic pilot test. Providers named a destination hospital and suggested a level of care in 60% of scenarios. Providers’ interpretation of the PDTree’s advised destination level agreed with the intended response for 71% of scenarios. Greater than 90% agreement was seen for burns, witnessed child abuse, and cervical spine injury. Less than 50% agreement was seen for shock and a non-distressed child with a traumatic injury. Provider responses were analyzed with Chi square tests, p < 0.01 and p value = 0.04, respectively.

Conclusions: EMS providers accurately interpreted the PDTree tool to determine the advised destination for a majority of pediatric scenarios. Future evaluation will focus on conditions with lower rates of agreement to determine if educational interventions or tool alterations are required. Virtual pilot testing using clinical vignettes is reasonable first step in assessing the usability of a novel clinical decision-making tool.

188. INTERPROFESSIONAL CRITICAL INCIDENT RESPONSE TRAINING FOR MEDICAL AND NURSING STUDENTS

Meina Michael, Nash Martinez, Dustin Smith, Ellen Reibling, Philippe Stanier, Paul Brian Savino, Lama Linda University. CATEGORY OF SUBMISSION: DISASTER

Background: Considering the recent rise in school shootings and mass casualty incidents, disaster preparedness training continues to be a vital component in the education of healthcare professionals. Physicians and nurses are expected to work effectively as a team in these rare and dire situations. We aimed to measure the impact of interprofessional critical incident response training on team-based performance among nursing and medical students. Methods: We developed a critical incident response course as a graduation requirement for senior medical and nursing students. The course consisted of online modules reviewing interprofessional communication, prehospital triage and decontamination principles, public health, and disaster response. The course concluded with a half-day hands-on exercise in which students rotated through prehospital modules (decontamination scenario and triage of a mass casualty active-shooter incident), as well as medical simulations of
resuscitations that required them to work as a team. We evaluated overall impact by administering a mandatory pre/post course assessment. Measures included the TeamSTEPPS Teamwork Attitudes Questionnaire (TAQ), and the University of Washington Pre/post Course Teamwork Assessment Evaluation of Teamwork Knowledge, Attitudes, and Skills for Health Sciences Students (UW). Descriptive analyses and significance testing of pre/post difference scores were performed with nonparametric tests in Stata 13 IC. Results: We report results comparing medicine and nursing providers participating in the pre or post course assessments. Pre/post course assessments showed statistically significant improvements in reported performance in team-based healthcare activities. Nursing providers reported increased 11%. Medical students reported scores for performance in interprofessional settings increased 9%, whereas nursing increased 19%. Pre/post difference scores for these differences were 0.05 and 0.01, respectively.

Conclusions: Teamwork and interprofessional performance improved for both computer-based and nursing students, however, there was no significant improvement among nursing students. We believe that implementation of interprofessional critical incident response training improves collaborative decision-making and dynamic between physicians and nurses; not only for disasters and mass casualty incidents, but also for day-to-day patient care.

189. HUMAN FACTORS IN PREHOSPITAL PEDIATRIC EMERGENCIES

Casey Dolen, Mustafa Ozkaynak, Kathym Raynapat, Kathrin Ademoglu, University of Colorado School of Medicine Category of Submission: Student, Resident, Fellow

Background: Pediatric emergencies represent a high risk, low frequency event for many Emergency Medical Services (EMS) agencies. Errors are common in pediatric prehospital care, however there is limited information on the role of team dynamics, human factors, and non-technical skills as a root cause. The objective of this study is to quantify human factors associated with errors and the impact on prehospital care.

Methods: This exploratory study utilizes task analysis of teams of 3-6 EMS providers from a metropolitan fire department participating in pediatric high-fidelity simulations. Scenarios included a 15-month-old with seizure activity and a 1-month-old with hypoglycemia. Each scenario required management of cyanosis from respiratory acidosis, compensated shock, and medication administration. One investigator performed task analysis via video review and quantified time to task completion (minutes/seconds) and number of providers involved. Human factors were evaluated using the standardized and validated Anesthesiologists Non-Technical Skills (ANTS) instrument scoring aspects of team management on a 1–5 scale; scores <3 representing patient safety. Of 112 EMS providers participated in 24 unique pediatric simulations. Task analysis revealed the following median times to interventions: oxygen delivery (1.2 min [IQR: 0.84, 1.78]), intravenous access: 5.03 (IQR: 3.55, 6.40), medication administration: 5.26 (IQR: 4.49, 6.59). From start of seizure, median time to recognition was 0.33 (IQR: 0.22, 0.49); all teams responded by changing management. Numerous tasks (i.e. checking pulse and breath sounds) were repeated by various teams without communicating findings to team members or for reassessing after interventions. Overall mean ANTS score was 2.2 with the following subcategory averages: task management: 2.2; team work: 2.2; situational awareness: 1.9; decision making: 2.4. Errors were observed in recognizing shock, safe administration of intravenous fluid, bag mask ventilation rate control, and using age appropriate restraint for transport. Conclusions: This study we noted that few providers demonstrated closed-loop communication, situational awareness, and role clarity. Interventions such as defining responsibilities, utilizing checklists, and effective communication may reduce errors in the prehospital care of children.

190. EPIDEMIOLOGY OF ACCELERATED USE OF 9-1-1 EMERGENCY MEDICAL SERVICES IN CITY OF LOS ANGELES, 2012–2016

Stephen Sanko, Marc Eckstein, Keck School of Medicine of the University of Southern California Category of Submission: Operations, Quality, Safety Systems

Background: The volume of 911-1 emergency medical service (EMS) incidents in Los Angeles has dramatically increased in recent years. The objective of this study was to describe population cohorts that appeared to be using 911 more frequently between 2012 and 2016. Methods: This was a retrospective, descriptive study of all electronic health records for the Los Angeles Fire Department (LAFD) for EMS incidents occurring between January 2012 and December 2016. Age, gender, incident location by battalion, and EMS provider impression are reported. Demographic data is based on 2010 U.S. Census. The geography of LAFD 14 battalions, classification of its 68 provider impression categories, trauma center criteria and policies relating to use of prehospital trauma care and mental health interventions were all unchanged during the study period. Results: From 2002 to 2011, the number of LAFD 9-1-1 EMS incidents increased on average 1.9% per year. From 2012 to 2016, average number of annual 9-1-1 EMS incidents increased to 4.8%. Systemwide, the rate of EMS incidents increased from 64.0 to 75.1 incidents per 1,000 residents, while in a single South LA battalion the rate increased from 72.9 to 106.9 incidents per 1,000 population. There was a bimodal distribution of age groups with accelerating rates in both men and women, with ages 25–39 and 55–69 accounting for 29.2% and 35.2% of attributable growth, respectively. A total of 74.1% of growth was attributable to 3 groups of EMS provider impressions: (1) mental health symptoms (29.5%, “weakness,” “flu-like symptoms,” “unknown medical”); (2) traumatic injury (24.4%); and mental health exacerbations (20.1%, “anxiety,” “depression,” “behavioral,” and “psychiatric emergency”). 68% of traumatic injuries and 50% of mental health exacerbations required no prehospital intervention. EMS were able to stabilize and transport to comfort as a goal were 0.05 and 0.01, respectively.

Conclusions: Teamwork and interprofessional performance improved for both medical and nursing students, however, there was no significant improvement among nursing students. We believe that implementation of interprofessional critical incident response training improves collaborative decision-making and dynamic between physicians and nurses; not only for disasters and mass casualty incidents, but also for day-to-day patient care.

191. ROLE OF PARAMEDICS PROVIDING PALLIATIVE CARE: A QUALITATIVE STUDY OF THE EXPERIENCES AND PROFESSIONAL IDENTITY

Alex Carter, Jan Jensen, Marianne Arab, Robin Urquhart, Katherine Houde, Michelle Harrison, Emergency Health Services, Nova Scotia & Dalhousie University, Division of EMS CATEGORY OF SUBMISSION: Professional

Background: In 2015, the “Paramedics Providing Palliative Care at Home” program was implemented in a provincial EMS system (Nova Scotia). Such expanded paramedic roles are part of the evolving identity of this profession. This study explored the experiences of those working in and with this program, the alignment of paramedic professional identity and role conflict.

Methods: In this qualitative study, paramedics and palliative care health providers (HCPs) were recruited from focus groups to explore: (1) understanding of and experiences with the expanded paramedic role in palliative care, (2) program alignment with paramedic professional identity, and (3) challenges. Data were collected until saturation and concurringly thematically analyzed.

Results: Of the 11 paramedics who participated, 8 (72.7%) were advanced level care, and had experience caring for palliative patients. Of the HCPs (n = 20), 14 (70.0%) were nurses, 5 (25.0%) in other HCP/administrative roles, and 1 (5.0%) physician. For experiences with this program 3 themes emerged: (1) the value of patient centered care and increased job satisfaction, (2) bridging a gap in care when the usual care team is delayed/unavailable, and (3) the value of providing psychosocial support to patients/families in crisis. For paramedic professional identity, 4 themes emerged: (1) palliative care demonstrates the ongoing evolution of paramedics as skilled clinicians, (2) providing this care and helping people in the community is of great value, (3) the paramedic skill set align well with palliative care needs, and (4) this fills a gap in the health system. Themes related to challenges were: (1) a change in mindset (from stabilize and transport to comfort as a goal of care and non-transport), (2) small/rural communities where paramedics personally know patients, and (3) paramedics not feeling part of the patient’s family/trusted team, perceiving communication and conflict issues with HCPs.

Conclusions: This study identified the experiences of paramedics and HCPs caring for palliative patients at home and found this expanded role is a positive evolution of paramedicine. Paramedics have increased satisfaction serving these patients, and this expanded role is a good fit with their professional identity. Challenges were identified that will be helpful for creating program improvements.

192. SITEWIDE SURVIVAL AFTER PEDIATRIC OUT-OF-HOSPITAL CARDIAC ARREST

Kevin Seaman, Bryan McNally, Melanie Gertner, Karen O’Connell, Jennifer Anders,
Background: The American Heart Association has identified cardiac arrest as a leading cause of death and committed to doubling survival rates by 2020. Despite the importance of this goal, a minimal amount is known about pediatric cardiac arrest survival.

Hypothesis: Participation in a cardiac arrest registry and provision data that better characterize the demographics and epidemiology of cardiac arrest in children.

Methods: All EMS agencies and acute care hospitals in Maryland began participation in the Cardiac Arrest Registry to Enhance Survival (CARES) in 2016. Calendar Year 2017 was the first reporting period in which 12 full months of data, including patient outcomes, was available statewide. Prehospital care was recorded into the electronic patient care report and, after quality checks, cases were uploaded to the CARES database. Hospitals reported outcomes for patients that survived to discharge.

Results: For the 2017 calendar year there were 6,886 non-traumatic cardiac arrests in Maryland, 154 (2.2%) were pediatric. Demographic and outcomes data were reported by age: infants (0 to 11 months), children (1 to <12 years) and teenagers (12 to 18 years). The majority were white (72.4%), followed by Black (14.6%), Hispanic (6.9%), and Asian (2.3%). No reported cases were Black males. There were no shockable initial rhythms for infants. For children 1 to <12 years, 3 of 6 (50%) were shockable, for teenagers 12 to 18 years, 6 of 28 were shockable (21.4%). Overall survival was 3.3% for age 0 to 11 months, 16.7% for age 1 to <12 years and 10.7% for teenagers. Utstein survival (Witnessed arrest, shockable initial rhythm, discharged alive) was 0%, 8.3% and 21.4% for the respective groups. Utstein survival for teenagers with shockable rhythms was 50% (3/6).

Conclusions: Participation in CARES helped characterize pediatric cardiac arrest in Maryland, with shockable rhythms being uncommon in infants and young children; rates of survival increased with age. Utstein survival is rare in infants, suggesting that alternate performance measures may be appropriate for this group. Utstein survivors for children and teenagers occurred solely from shockable initial rhythms. Contributing cardiac arrest data to CARES can facilitate the development of educational and training interventions on pediatric outcomes over time.

194. UTILIZING THE NEMIS DATABASE TO ASSESS FOR AN ASSOCIATION BETWEEN STATE OPEN CARRY LAWS AND EMS ACTIVATIONS FOR FIREARM INJURIES

Paul James Diggins Roszko, Andrea McGlynn, Megan Ranney, Walter Reed National Military Medical Center

Background: Firearms accounted for 16.9% of all injuries leading to death in the United States in 2015. States have adopted different laws to regulate firearms, including permitting or banning open carry of handguns and long weapons. We sought to determine the feasibility of using the 2015 NEMIS database to assess for an association between a State’s open carry laws and EMS activations for firearm injury.

Methods: States were grouped according to the restrictiveness of their open carry laws (Law Group, scale of 1–5). This code was added to the 2015 NEMSIS dataset as a unique data element (NEMSIS data at the State level is not publicly available). EMS encounters were filtered according to data elements E03_01 Dispatch Code (289: Stab/Gunshot wound) and E10_01 Cause of Injury Code (9565 Firearm Injury Accidental, 9560 Firearm Assault, or 9570 Firearm Self-Inflicted). Encounters coded as E03_01 -530 Stab/Gunshot were excluded. Events where the gun was not listed were retained. In the E10_01 Cause of Injury code. Demographic data on Gender, Race, Age, and Patient Destination were gathered. Incidence rates were calculated using 2010 US Census records. Results: 93,485 events were identified; 56,222 had an undefined cause of injury, leaving 37,263 events. 24,227 were assaults, 5,543 were accidental injuries, and 7,493 were self-inflicted injuries. 17,477 events were recorded in States (n = 31) that allow open carry of firearms and 6,675 events (17.9%) occurred in States (n = 3) that banned the open carry of handguns but allowed open carry of long guns with a permit. 84% of patients were male, 39.7% were Black, and 66% were ages 10–39 years. 27,191 patients (73%) were transported by EMS, and 5,516 patients (14.8%) were found dead at the scene. Incidence rates (per 100,000) for each law group were: 1–5,12.2; 2–20.86; 3–5.69; 4–28.49; 5–28.49.

Conclusions: A number of limitations, including incomplete data reporting by State EMS agencies to NEMSIS and the inability to analyze data at the State level, prevented a more robust analysis between Law Groups.

195. POTENTIAL REDUCTION IN HOSPITAL ADMISSION OF EMERGENCY DEPARTMENT PATIENTS THROUGH COMMUNITY PARADIGM PARTNERSHIP

Paula Miller, Tia Radant, Aaron Burnett, Sandi Wewerka, Regions Hospital

Background: A unique Community Paradigm (CP) model, known as the Level I Trauma center was launched in 2014. After piloting this program with patients discharged from the hospital with acute exacerbation of congestive heart failure, an initiative was undertaken to plan expansion of the CP program to additional patients and care areas. Objective: To quantify the potential reduction in inpatient and observation admissions for patients seen in the Emergency Department (ED) of a Level I Trauma center if the treating ED provider had the option to discharge the patient with CP follow-up.

Methods: Research staff approached ED providers at the end of each provider shift for a period of 21 days. Research staff asked providers to report on how many patients they could have sent home instead of admitting to inpatient or observation if a CP had been available to do a home visit within 24 hours. Research staff provided a data sheet on what a CP in the provider requested more information, including 2 scenario examples and a list of what elements may be included in a CP home visit. Results: 100 provider surveys were conducted in total, including 24 from day shifts, 40 from evening shifts, and 36 from overnight shifts. Providers surveyed during this time period saw a total of 1,719 patients. Of these, 297 (17.3%) were ultimately admitted as inpatients and 92 (5.4%) were admitted to observation, for a total of 389 (22.6%) patients admitted. Of these 389 admitted patients, providers reported that 26 (6.7%) could have avoided admission if there was a CP available to visit them within 24 hours.

Conclusions: Increasing patient volumes in both the ED and greater hospital pose challenges in providing the correct care to each patient. Lack of bed availability can easily impede ED patient flow. ED providers are being charged with lower-cost healthcare services, resulting in potentially significant cost savings and increased availability of resources.
William Mulkerrin, Ilana Spokovny, Jonathan Francisco, Brandon Lima, Kian NIHSS, Pennsylvania, D. Gilbert, Prasanthi Govindarajan, Stanford University, Department of Emergency Medicine

Background: Modified NIHSS (National Institute of Health Stroke Scale) is a 11-item examination tool used by neurologists to assess neurological deficit. The purpose of this study was to analyze the neurological deficit in patients who die from an opioid-related death. This novel research provides insights into determining the neurological deficit in patients who die from an opioid-related death. A prospective, cohort study that was conducted in a fire-based EMS agency in California during a 20-month period (November 2016–June 2018). We trained 40 ALS-trained Paramedics in Emergency Neurological Life Support (ENLS) stroke curriculum and the AHA/ASA NIHSS certification. Patients were eligible if they were over the age of 18 years, with acute neurological deficit consistent with suspected acute stroke. Non-English speaking or vaso-vision were excluded. The paramedics obtained a stroke-specific history, completed the modified NIHSS, and assessed for contraindications for acute stroke treatment. This data was linked with the hospital outcomes using unique identifiers. We calculated the test performance of NIHSS and NIHSS in the emergency department using the gold standard CTA imaging. The reliability between paramedic and stroke team NIHSS scores using a Bland-Altman plot. Results: Of the 31 patients, paramedics and stroke neurologist scores differed by 0–2 points in 42% of patients, 3–4 points in 39% patients, and greater than 4 points in 19% patients. 10 patients (32.3%) had an LVO on CTA. Of the 10 with LVO, 6 had a modified NIHSS of ≥7 and a test sensitivity of 60.0% (95%CI: 22.5–87.8) and a specificity of 57.1% (95%CI: 34.0–78.2). Conclusions: In a single-center study, NIHSS had moderate sensitivity for LVO. Paramedics were able to complete a stroke scale with high reliability.

197. PREVALENCE OF OPIOID RELATED DEATHS WITH PREVIOUS NALOXONE ENCOUNTERS IN A MESSIZI METROPOLITAN COUNTY: A CHART REVIEW

Thomas Dykstra, Jen Knapp, Ian Gatcch, Jana Sanders, Kristin Lytal, EMS Foundation, City of Fort Wayne, Indiana Category of Submission: STUDENT, RESIDENT, FELLOW

Background: The current opioid epidemic has spread nationwide. The CDC reported in 2016, drug overdoses killed 63,632 Americans with nearly two-thirds of these deaths involving prescription or illicit opioids. To understand this epidemic, there have been numerous studies examining varied parameters. However, published research does not specify the proportion of patients who die from an opioid related overdose who had a previous EMS or emergency department (ED) naloxone administration. The purpose of this study was to analyze data from consecutive opioid-related deaths and previous naloxone encounters with a 29,000 transport EMS system, one city ED (65,000 visits), a suburban ED (60,000 visits), and the County Department of Health. Methods: This was a retrospective chart review using EMS and hospital data spanning January 2010 through December 2017, and hospital data spanning February 2013 through December 2017. The Department of Health provided data for all opioid-related deaths from January 2010 through December 2017. The subset of naloxone encounters was extracted from this total, with EMS accounting for 68.5%. Results: Of all patients who died from an opioid-related overdose, 69.0% did not have a previous naloxone encounter, compared to 15.1% who had at least one previous encounter. This difference was statistically significant (P-value < 0.0001). 15.9% of patients were excluded secondary to their initial encounter being on the date of their death. Analyzing only 2013 data identified 7.8% of opioid-related deaths were individuals who had a previous naloxone encounter. In 2017, 59.7% were opioid-related deaths accounted for 22.0%. This difference was statistically significant (P-value = 0.03). Analysis from 2010 through 2017 revealed a median time from initial encounter to the date of confirmed opioid death was 309 days.

Conclusions: Focusing on specific patients with an initial naloxone encounter, either by EMS or the hospital emergency departments, offers a unique opportunity to impact opioid-related deaths. This novel research provides evidence that there is a clearly identified window of opportunity to intervene with these high-risk patients.

Jonathan Thorndike, Carlin Chuck, Janette Baird, Nicholas Asselin, Brown University Category of Submission: CARDIAC

Background: In 2017, the Rhode Island Department of Health implemented a clinical protocol mandating 30 minutes of CPR prior to transport for all non-traumatic OHCA patients. This study seeks to describe the effects of this intervention on patient outcomes. Methods: We queried our hospital electronic medical record (EMR) for adult patients presenting to one of 3 emergency departments in our system. Those with an ESI of 1 were further chart reviewed to identify cases of OHCA. EMR data were available from 3 distinct protocol phases between March 2016 and September 2017. Pre-protocol, implementation and post protocol. Cases were excluded if ROSC was achieved prior to EMS contact, or if OHCA was deemed to be traumatic. Results: A total of 872 cases of OHCA were reviewed. Median patient age was 66 (IQR: 53.77), 35% were female and the number of comorbid conditions did not change across 3 assessed time periods. Witness arrest occurred in 34% of patients in pre-protocol and implementation phases, and occurred in 45.5% of OHCA post-protocol. 24.6% of patients had an initial shockable rhythm, which did not change significantly across time periods. Prehospital ROSC increased after implementation of the protocol: Of 543 patients with complete data (97.5%) in post-protocol, 29.1% had prehospital ROSC. This increased across time periods, from 12.1% to 14% to 26.4% (P = 0.001). When controlling for arrest characteristics, there was no significant change post-protocol implementation. EMS providers adhered to the CPR protocol and the median on-scene CPR time increased from 14 (IQR: 9.17) pre to 30 (IQR: 24.36) post-implementation. 8% of patients survived to discharge from the hospital, among whom 44–60% had a favorable neurologic outcome (CPC 1 or 2), with no significant change across time periods when controlling for arrest characteristics. More patients had supra-glottic devices or endotracheal tubes post-protocol (50–68%; Δ 18%; 95% CI: 12.24%). Conclusions: Patients suffering from OHCA had higher ROSC in the post-intervention time period, although when controlling for whether the arrest was witnessed, shockable or had bystander CPR, there was no significant change. Survival to discharge was not affected by this isolated protocol change.

199. CARDIAC ARREST RESUSCITATION EVALUATION IN LOS ANGELES CARE-LA 2016

Stephen Sanko, Michael Stone, Marc Eckstein, Keck School of Medicine of the University of Southern California Category of Submission: CARDIAC

Background: This study reports the epidemiology and outcomes from out-of-hospital cardiac arrest (OHCA) in the City of Los Angeles during 2016, and compares these results to previously published data. Methods: This was a prospective observational study of Los Angeles Fire Department (LAFD)-attended OHCA patients with attempted resuscitation from January 1 to December 31, 2016. Data elements conform to 2014 Utstein template recommendations. Patients missing survival outcomes were presumed dead. The primary outcome was neurologically-intact survival at hospital discharge. Results: In 2016, 2,443 OHCA cases were treated by LAFD 911-responders (62 per 100,000 population). The mean age was 64.9 (SD = 20.1) years, and 61.6% were male. 813 (33.2%) cases were witnessed, including 519 by bystanders (21.2%). A total of 55.6% all non-EMS witnessed cases had bystander CPR, while public access defibrillators were applied in only 2.6% of such cases. Using 2014 Utstein criteria, among all OHCA cases with attempted resuscitation survival to hospital discharge was 10.6% (95% CI: 8.7%–12.6%). Survival to hospital discharge improved from 2.1% to 11.1% (p < 0.01) and neuro-intact survival improved from 1.4% to 4.7% (p < 0.01) while shockable bystander-witnessed neuro-intact survival improved from 6.0% to 22.6% (p < 0.01). Lower shockable bystander-witnessed neuro-intact survival improved from 6.0% to 22.6% (p < 0.01). Conclusions: Survival and neuro-intact survival from cardiac arrest improved in the densely urban city of Los Angeles from 2000 to 2016. Further studies are needed to pinpoint determinants of these improvements. Opportunities exist to optimize bystander intervention, including AED use.

200. PREHOSPITAL ADMINISTRATION OF TRANEXAMIC ACID (TXA) IN PATIENTS WITH MAJOR HEMORRHAGE

Michael Carr, Lauryn Kosturko, James Tate, Laura Fawcett, Kevin Roebuck, Robert Kohne, Alexander Torres, AJ McKechnie, Mark Merlin, Emory University Category of Submission: TRAUMA

Background: Tranexamic acid (TXA) is an inhibitor of fibrin-degradation. By blocking the activation of plasminogen to plasmin,
the body’s normal process of fibrin degradation is hindered. In massive hemorrhage, clotting will remain viable and complicates acute deterioration. There are several randomized trials that have established its safety and efficacy. The purpose of this study was to analyze demographic, biometrics, and hospital outcomes of patients who received TXA in the prehospital setting compared to a control group. Our primary outcome was survival to hospital discharge. Methods: A retrospective analysis of patients who received TXA for treatment of hemorrhage secondary to blunt trauma, post-operative complications, or dialysis access malfunction between May 1, 2015 and March 1, 2018. Patients were given 1g of IV or IO TXA over 10 minutes. Inclusion criteria was patients over 16 years with major bleeding or a risk for major bleeding due to trauma, laceration, dialysis access malfunction, postsurgical bleeding, or current/previous recent subarachnoid hemorrhage. The control group population was taken from January 1, 2013 and overlapped into the protocol period to May 1, 2015. Pre-hospital injury severity score was used to adjust for this overlap and for confounders. Results: Seventy-seven subjects met criteria for the treatment group and 49 patients met criteria for the control group. There were no significant differences between groups in baseline demographic characteristics. There was a significant difference in treatment group as there was a greater number of patients with blunt trauma in the control group (74% compared to 66%, p = 0.04). After propensity score matching on treatment category, age, sex, and weight, we demonstrated 88.33% survival to discharge in the treatment group compared to 69.44% survival to discharge in the control group (p = 0.04). Conclusions: TXA use is feasible to use in the prehospital setting for a variety of causes of major hemorrhage. Limitations include a retrospective analysis. Propensity score matching allowed for a clinically noticeable trend towards increased survival to discharge. Due to low power we did not dem- onstrate the significance. Further evidence emerges, the results of this study support the use of TXA during prehospital treatment of patients with various causes of major hemorrhage.

201. VARIATION IN BURNOUT PREVALENCE ACROSS EMS AGENCIES IN SOUTH CAROLINA AND ASSOCIATED JOB CHARACTERISTICS

Remle Crowe, Rebecca Cash, Madison Rivard, Ashish Panchal, Antonio Fernandez, Robert Wright, Sarah Anderson, Ontye Hogan, Rebecca Andridge, Amy Ferkelth, The National Registry of EMTs, The Ohio State University College of Public Health Category of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: The prevalence of burnout may vary between EMS agencies. Further, job characteristics (demands and resources) may affect burnout in EMS, yet specific characteristics have not been explored. Our objective was to quantify burnout at the agency-level and examine burnout prevalence among respondents. Generalized estimating equations with robust standard errors were used to assess the relationship between burnout rates, geographic location and burnout while accounting for clustering by main EMS agency and adjusting for the following confounding variables: certification level, experience, full-time status, call volume, agency type, and urbanity. A 4-level variable was created to assess the association of burnout with low demands/high resources, high demands/ low resources, high demands/high resources, and high demands/lower resources. Inclusion criteria consisted of EMS professionals practicing at the emergency medical technician level or higher who had provided patient care during the month preceding the survey. Results: We received 1,490/8,059 responses (19%) and 1,271 (85%) met inclusion criteria. Agency-level burnout prevalence ranged from 0 to 83% (median:37%). Compared to EMS professionals working in settings with low job demands and high resources (19% of respondents exposed to high demands and low resources (30%) experienced over a 9-fold increase in odds of burnout (OR:50, 95%CI: 6.39-14.10). Meanwhile, those with high demands and high resources (36% of respondents) had a 6-fold increase in odds of burnout (OR:6.47, 95%CI: 3.61-11.59). Job resources associated with increased burnout were 67.7% male (302/446), higher who had provided patient care during the study period. The patients pharyngally restrained were 67.7% male (302/446), with an average age of 37.6. The prehospital record identified a suspected psychiatric history in 31.2% these patients (19/646) and of suspected drug use in 61.7% (275/ 446). Paramedics administered medication for chemical restraint in 30.8% of patients (138/446), with benzodiazepines being the most common medication (109/446, 24.4%). Haloperidol was given to 34/446 patients (7.6%), and ketamine to 11/446 patients (2.5%). One hundred forty patients were transported to our hospital, and we were able to analyze records for 129/140 (92%). Prehospital restraint was not associated with higher rates of admission (42.5% vs. 41.6%, OR 1.04, 95% CI: 0.49–2.21), or longer ED LOS (mean 261 min vs. 253 min, p value 0.767). Conclusions: Burnout prevalence varied widely across EMS agencies. Increased job demands may have a mitigating effect on the relationship between high job demands and burnout. Limitations include the cross-sectional analysis, lack of a single study population, and potential response bias.

202. PATTERNS OF CHEMICAL RESTRAINT ADMINISTRATION AMONG PHYSICALLY RESTRAINED PREHOSPITAL PATIENTS AND IMPACT ON EMERGENCY DEPARTMENT DISPOSITION

Rachel Semmons, Alicia Nassar, Stephanie Tershakov, Kyle Friez, Megan Tyler, Andrew Thomas, Jason Wilson, University of South Florida Category of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: The administration of chemical restraint may be used for protection of patients and medical personnel when patients are agitated or combative secondary to psychiatric, toxicologic, or other pathology. The risks of physical restraints and of the various medications used for chemical restraint have been well described, but there is a paucity of literature describing patterns of restraint use and its potential impact on the patient’s emergency department (ED) course. Methods: We conducted a retrospective chart survey of patients transported by our EMS system from August 1, 2015 to June 30, 2018 who had a treatment intervention of physical restraint charted in the patient care record. This cohort was analyzed to determine the demographics of patients who were physically restrained (non-discretionary indication), and to determine rates of medication administration for the purpose of chemical restraint. We further analyzed ED records of these patients who were transported to one hospital, looking at ED disposition as our primary outcome, and ED length of stay (LOS), and potential adverse outcomes from physical or chemical restraint. Results: There were 468,493 total patient encounters during the study period. The patients physically restrained were 67.7% male (302/ 446), with an average age of 37.6. The prehos- pital record identified a suspected psychiatric history in 31.2% these patients (19/646) and of suspected drug use in 61.7% (275/ 446). Paramedics administered medication for chemical restraint in 30.8% of patients (138/446), with benzodiazepines being the most common medication (109/446, 24.4%). Haloperidol was given to 34/446 patients (7.6%), and ketamine to 11/446 patients (2.5%). One hundred forty patients were transported to our hospital, and we were able to analyze records for 129/140 (92%). Prehospital restraint was not associated with higher rates of admission (42.5% vs. 41.6%, OR 1.04, 95% CI: 0.49–2.21), or longer ED LOS (mean 261 min vs. 253 min, p value 0.767). Conclusions: In our patient population, para- medics used chemical restraint in the minor- ity of patients who required physical restraint for agitation. The addition of chemical restraint was not associated with a sig- nificant increase in ED LOS and admission rates.

203. IMPACT OF IMPLEMENTING AUTOMATED DISPENSING SYSTEMS ON THE USE OF MIDAZOLAM AND MORPHINE BY FIRE-BASED EMS PROVIDERS

Denise Whitlefield, Clayton Kazan, Nicole Steeneken, Nichole Bosson, Los Angeles County EMS Agency/Harbor-UCLA Department of Emergency Medicine Category of Submission: OPERATIONS, QUALITY, SAFETY SYSTEMS

Background: Automated Dispensing Systems (ADS) improve in-hospital medication dispensing but have not been previously studied for EMS use. We evaluated the administration of midazolam and morphine by EMS providers before and after implementation of ADS for controlled medication restock. We hypothesized that the simplified re-stock process would increase administration overall and increase administration for discretionary indications, but have no effect on administration for non-discretionary indications. Methods: This was a retrospective analysis of fire- based EMS provider data before (July 1, 2016–May 31, 2017) and after (July 1, 2016–May 31, 2018) transition from hospital-based controlled medication re-stock to an ADS model. The primary outcome measure was the frequency of midazolam and morphine administration before and after ADS implementation. Sub-groups included: (1) midazolam administration for discretionary indications (sedation for anxiety/agitation and/or painful procedures) and non-discretionary indications (seizure, agitated delir- ium) and (2) morphine administration for discretionary indications (any traumatic injury) and non-discretionary indications (documented pain score ≥5). The risk dif- ference with 95% confidence interval for controlled medication administration pre- and post-ADS implementation was calcu- lated. Results: Out of 260,493 total patient encounters before ADS implementation, 261 patients received midazolam to 1303 patients (0.5%) and morphine to 2078 patients (0.8%) as compared with 262,440 patient post-ADS in
whom paramedics administered midazolam to 1711 (0.7%) and morphine to 2468 (0.9%), risk of 0.5% (95% CI: 0.1%, 0.2%), and RD 0.1% (95% CI: 0.1%, 0.2%), respectively. The relative increase in midazolam and morphine administration was 30% and 15%, respectively. Midazolam was administered for sedation in 70/21341 patients (0.3%) pre-ADS and 88/24676 patients (0.4%) post-ADS [RD 0.03% (95% CI: -0.1%, 0.1%), for seizure in 1008/9954 patients (10.1%) pre-ADS and 1240/10585 patients (11.7%) post-ADS [RD 1.6% (95% CI: 0.7%, 2.4%)], and for agitation delirium in 73/264 patients (27.6%) pre-ADS and 168/558 patients (30.1%) post-ADS [RD 2.5% (95% CI: -4.1%, 9.1%)]. Morphine was administered to 1528/34263 patients (4.5%) with traumatic injury pre-ADS and 1864/35355 patients (5.3%) post-ADS [RD 0.8% (95% CI: 0.5%, 1.1%)]. Among patients with a documented pain score >5, morphine was administered: 416/1717 (24.2%) pre-ADS and 2047/26025 (7.9%) patients post-ADS, RD – 0.3% (95% CI: -0.9%, 0.2%).

Conclusions: ADS implementation in the pre-hospital phase increased the use of midazolam and morphine administration.

2.5% (95% CI: 0.1%, 0.2%) and 0.3% pre-ADS and 88/24676 patients (0.4%) post-ADS [RD 0.03% (95% CI: -0.1%, 0.1%), for seizure in 1008/9954 patients (10.1%) pre-ADS and 1240/10585 patients (11.7%) post-ADS [RD 1.6% (95% CI: 0.7%, 2.4%)], and for agitation delirium in 73/264 patients (27.6%) pre-ADS and 168/558 patients (30.1%) post-ADS [RD 2.5% (95% CI: -4.1%, 9.1%)]. Morphine was administered to 1528/34263 patients (4.5%) with traumatic injury pre-ADS and 1864/35355 patients (5.3%) post-ADS [RD 0.8% (95% CI: 0.5%, 1.1%)]. Among patients with a documented pain score >5, morphine was administered: 416/1717 (24.2%) pre-ADS and 2047/26025 (7.9%) patients post-ADS, RD – 0.3% (95% CI: -0.9%, 0.2%).

Conclusions: ADS implementation in the pre-hospital phase increased the use of midazolam and morphine administration.
were separated by cannulation prior to or after arrival of EMS and scene times compared. After approval, data were abstracted by authors on a standardized form and evaluated with descriptive statistics while times were compared between the different groups with an independent t-test. Results: Average distance traveled and transit time was 37.5 miles (1 to 109) and 53.6 minutes (9 to 120). Mean scene time was 145.7 minutes and was significantly longer for patients cannulated after EMS arrival (213.2 vs. 95.1, SD 77.8 vs. 59.9, at significance p = 0.007). 14/15 patients had ventilator PEEP > 5 and 4/15 had support devices including balloon pumps, percutaneous ven-tricular assist devices, pacers, and inhaled epoprostenol. Medications included vaso-pressors (12/15), sedatives (12/15), paralytics (8/15), narcotics (6/15), anticoagulants (6/15), isotropes (4/15), bicarbonate (4/15), and blood products (4/15). 8/15 had interven-tional cardiology providers immediately called for an ALS ground activation. In addition, BLS providers encountered clinical improvement. One paper reported an adverse event attributable to epinephrine administration to inform a proposed review for relevance by 2 independent reviewers. Subsequently, the full text of each retained article was reviewed, again by 2 independent reviewers using a structured form to extract and summarize data. Results: After excluding duplicates, 166 titles and abstracts were reviewed; 20 articles were retained—along with one additional article was published during the review process—for full review (overall agreement 85%; Kappa = 0.54). Three of the 21 articles reported data relevant to BLS administration of non-EAI epinephrine. Collectively, these articles report 433 instances of non-EAI epinephrine administration by BLS providers, with the majority of patients (80-90%) experiencing clinical improvement. One paper reported insufficient data to calculate the indications for epinephrine in approximately 10% of the cases, but physician review of the full record confirmed administration was appropriate in all 433 cases and non-EAI epinephrine administration for non-EAI patients (2-3%). There was only one report of an adverse event attributable to epinephrine administration: an episode of near-syncope in a patient with a heart rate of 100 and a blood pressure of 135/80 mmHg.

Conclusions: There is no evidence to demonstrate that BLS administration of non-EAI epinephrine is inferior to EAI-epinephrine administration in terms of either safety or efficacy. Restricting BLS epinephrine administration to EAsIs appears unwarranted.
congestion. Other complications associated with placement and use of the King LTS-D airway device have been inadequately assessed or reported on. The objective of this study was to categorize King LTS-D complications associated with placement and further describe their respective causes and clinical outcomes. 

**Methods:** This chart review (retrospective) analysis examined all patients (18 years and older) that received a King LTS-D placement from a large, single EMS provider (ground and rotor wing air) and transported to a tertiary care center in a Midwestern city from January 2011 through May 2017. Following identification, an independent, single emergency physician review of records categorized complications as follows: 1-Device complication (i.e. ruptured balloon); 2-Anatomic complication (i.e., epiglottitis, severe mouth/facial trauma); 3-Human error (i.e., balloon over inflation) 

**Results:** There were 65 patients included in the analysis. Median age was 61.9 years and 42 (64.6%) were male. There were 10 cases (15.4%) where a complication was found. Anatomic complications occurred in 5 cases (50.0%); human error was found to be the cause of one (10.0%) and device error was found in 4 (40.0%). Thirteen patients (20.0%) died in the emergency department and the remaining 52 (80.0%) were admitted to the hospital. All 52 admitted patients had the King device replaced: 44 (84.6%) with an endotracheal tube and 8 (15.4%) with surgical tracheostomy. 

**Conclusions:** Complications were noted in 10 (15.4%) cases, although device failure only occurred in 4 patients (6.2%) within this population. The highest rates of issues were due to anatomical complications. The King LTS-D is used by this service as a back-up or difficult airway device, therefore anatomical complications are expected. 

212. **BARIATRIC LIFT PROTOTYPE**

Mary Bethany Glatz, Christina Salas, David Grow, Coffee Brown, Justin Baca, University of New Mexico, Emergency Medicine 

**Background:** The primary objective of this study is to obtain feedback from EMS providers on the design of a bariatric lift prototype system by performing simulated patient lifts with the prototype and a standard backboard. The secondary objective of this study is to demonstrate a framework for iterative design collaboration between emergency medicine clinicians and engineers to approach common challenges in emergency medicine. 

**Methods:** This is a single center study with a study group of twelve participants for the initial evaluation (focus) group of end-users. A structured interview and simulated lifting task was administered using the prototype and standard equipment. After completion of each lifting task, subjects completed a short survey rating the difficulty of the tasks with demographic questions. 

**Results:** Twelve subjects were recruited to complete the patient transfer tasks and provider feedback. Average age of participants as 35 years with average number of years performing patient transfers of 7 years. The majority of subjects (91%) stated that the bariatric lift was easy to use. A total of 58% of subjects thought that the bariatric lift would decrease patient transfer time. 100% of subjects would use this device in the field and 91% thought the bariatric lift would help decrease injuries. 

**Conclusions:** EMS providers encounter multiple risks at work, including the risk of injury due to lifting and transporting patients. In this study we developed a prototype of a bariatric lift system and performed initial end-user testing to obtain important feedback on the design. According to our initial focus group, the bariatric lift may be an easy addition to regular backboards, allowing any backboard to become a bariatric backboard – protecting patients and EMS personnel. This study also demonstrates a framework for emergency medicine clinicians and engineers to work together to address common clinical problems in emergency medicine.