

1. Crowe, R.P., Bourn, S.S., Fernandez, A.R., Myers, J.B. (2021): Initial Prehospital Rapid Emergency Medicine Score (REMS) as a Predictor of Patient Outcomes, Prehospital Emergency Care, DOI: [10.1080/10903127.2020.1862944](https://doi.org/10.1080/10903127.2020.1862944)

The study objective was to assess predictive characteristics of initial prehospital Rapid Emergency Medicine Score (REMS) for ED disposition and overall patient mortality. This study used linked prehospital and Health Data Exchange records from the national ESO Data Collaborative. All 911 responses from January 1, 2019 to December 31, 2019 were included. REMS (0–26) was calculated using age and first prehospital values for: pulse rate, mean arterial pressure, respiratory rate, oxygen saturation, and Glasgow Coma Scale. Non-transported, patients <18 and cardiac arrests prior to EMS arrival were excluded. The primary outcome was ED disposition, dichotomized to discharge versus admission, transfer, or death. The secondary outcome was overall survival to discharge (ED or inpatient). Predictive ability was assessed using area under the receiver operating curve (AUROC). Optimal REMS cut points were determined using test characteristic curves. Univariable logistic regression modeling was used to quantify the association between initial prehospital REMS and each outcome. A REMS of 5 or lower demonstrated optimal statistical prediction for ED discharge versus not discharged (admission/transfer/death) (AUROC: 0.68). Patients with initial prehospital REMS of 5 or lower showed a three-fold increase in odds of ED discharge (OR: 3.28, 95%CI: 3.24–3.32). A score 7 or lower was statistically optimal for predicting survival. Initial prehospital REMS of 7 or lower was associated with a five-fold increase in odds of overall survival (OR:5.41, 95%CI:5.15–5.69).

2. Fernandez, A.R., Crowe, R.P., Bourn, S., Matt, S.E. Brown, A.L., Hawthorn, A.B., Myers, B. COVID-19 Preliminary Case Series: Characteristics of EMS Encounters with Linked Hospital Diagnoses. *Prehosp Emerg Care*. 2020 Jul 31;1-12.doi: [10.1080/10903127.2020.1792016](https://doi.org/10.1080/10903127.2020.1792016).

The study objective was to describe prehospital encounters for patients with a COVID-19 hospital diagnosis and/or COVID-19 EMS suspicion versus those with neither a hospital diagnosis nor EMS suspicion of the disease. All ESO records for 9-1-1 responses between March 1 and April 19, 2020, resulting in transport to a hospital, with at least one ICD-10 outcome returned via the Health Data Exchange were included. COVID-19 EMS suspicion was defined as a documented EMS primary or secondary impression of COVID-19, or indication of COVID-19 suspicion in the prehospital free-text narrative. There were 84,540 EMS patient records with linked hospital ICD-10 codes included, 814 (1%) patients had a COVID-19 hospital diagnosis. Overall, COVID-19 EMS suspicion was documented for 3,204 (4%) patients. COVID-19 EMS suspicion demonstrated a sensitivity of 78% for those with a hospital diagnosis of COVID-19. Among EMS suspected COVID-19 patients, the probability of a COVID-19 hospital diagnosis was 20%. Among those patients for whom EMS did not document suspicion of COVID-19, the probability of not having a hospital diagnosis of COVID-19 was 99.8%. Those with COVID-19 hospital diagnoses were more likely to present with tachycardia, tachypnea, hypoxia, and fever during the EMS encounter. EMS responses for patients diagnosed with COVID-19 were also more likely to originate from a skilled nursing/assisted living facility. EMS PPE (eye protection, mask, or gown) use was more frequently documented on records of patients who had hospital diagnosed COVID-19.

3. George TP, Chan HK, Crowe RP, Jarvis JL, Jansen JO, Huebinger RM, Wang HE. Clinical characteristics and course of out-of-hospital shock in a national emergency medical services cohort. *J Am Coll Emerg Physicians Open*. 2020 May 23;1(4):432-439. doi: [10.1002/emp2.12090](https://doi.org/10.1002/emp2.12090). PMID: 33000067; PMCID: PMC7493535.

The study objective was to characterize adult out-of-hospital shock care in a national EMS cohort. The 2018 ESO research dataset was used for this analysis. The study evaluated adult (age ≥ 18 years) non-cardiac arrest patients with shock, defined as initial systolic blood pressure ≤ 80 mm Hg. Among 6,156,895 adult 911 responses, shock was present in 62,867 (1.02%; 95% confidence interval = 1.01%-1.03%); 54,239 (86.3%) medical and 5978 (9.5%) traumatic, and 2650 unknown. Medical was more common than traumatic shock in women and older patients. The most common injuries associated with traumatic shock were falls (37.6%) and motor vehicle crashes (18.7%). Mean initial and final medical systolic blood pressure were 71 ± 10 mm Hg and 99 ± 24 mm Hg. Systolic blood pressure increased in 88.8% and decreased or did not change in 11.0%. Mean initial and final trauma systolic blood pressure were 71 ± 13 mm Hg and 105 ± 28 mm Hg; systolic blood pressure increased in 90.4% and decreased/did not change in 9.6%. On fractional polynomial modeling, systolic blood pressure changes were greater and faster for trauma than medical shock.

4. **Jarvis JL, Hamilton V, Taigman M, Brown LH. Using Red Lights and Sirens for Emergency Ambulance Response: How Often are Potentially Life-Saving Interventions Performed? [published online ahead of print, 2020 Jul 17]. Prehosp Emerg Care. 2020;1-13. doi:10.1080/10903127.2020.1797963**

The study objective was to describe the frequency and nature of 9-1-1 calls that result in potentially life-saving interventions during the call. The 2018 ESO research dataset was used for this analysis. Use of lights and sirens, call nature, and interventions performed were evaluated. The definition of potentially life-saving interventions was developed a priori through a consensus process and included both interventions, medications, and critical hospital notifications. The proportion of calls with lights and sirens response as well as with potentially life-saving interventions performed was calculated. The calculation was performed for total calls as well as stratified by call nature. There were 5,977,612 calls from 1,187 agencies included in the analysis. The consensus process identified 42 potentially life-saving interventions. Over 85% of calls utilized lights and sirens, however only 7% resulted in a potentially life saving intervention. cardiac arrest calls had the highest frequency PLSI (45.0%); followed by diabetic problems (37.0%). Glucose was the most frequently given PLSI, n =69,036. When including multiple administrations to the same patient, epinephrine was given most commonly PLSI, n = 157,282 administrations).

5. **Jarvis J., Johnson B., Crowe R.P. Out-of-hospital Assessment and Treatment of Adults with Atraumatic Headache. JACEP Open. 2020; 1–7.**

The study objective was to describe the out-of-hospital assessment and treatment of adults with benign headache. Meaningful pain reduction stratified by commonly administered medications was also described. ESO data from January 1, 2018 to December 31, 2018 were analyzed. All 911 responses by paramedics for patients 18 and older with headache were included. Patients with trauma, fever, suspected alcohol/drug use, or who received medications suggestive of an alternate condition were excluded. Out-of-hospital pain scores were documented infrequently and less than one in five patients with initial pain scores >5 received medication. Of the 5,977,612 emergency responses, 1.1% (66,235) had a provider documented primary impression of headache or migraine and 52.5% (34,763) met inclusion criteria. An initial pain score was recorded for 73.5% (25,544) of patients, and 58.5% (14,948) of these patients had multiple pain scores documented. Of the patients with multiple pain scores documented, 53.8% (8,037) of patients had an initial pain score >5 . Of these, 7.1% (573) were administered any medication. Among patients receiving a single medication, Fentanyl was the most commonly administered (32.1%, 126). As a group, opioids were the most commonly administered class of drugs (38.9%, 153) and were associated with the largest proportion of clinically significant pain reduction (69.3%,106).

6. **Crowe RP, Myers JB, Fernandez AR, Bourn S, McMullan JT. The Cincinnati Prehospital Stroke Scale Compared to Stroke Severity Tools for Large Vessel Occlusion Stroke Prediction. *Prehosp Emerg Care.* 2020 Feb 4:1-15. doi: 10.1080/10903127.2020.1725198.**

The study objective was to determine whether newly-developed LVO stroke scales offer a clinically-meaningful advantage over the Cincinnati Prehospital Stroke Scale (CPSS). ESO Health Data Exchange data from January 1, 2018 and December 31, 2018 was analyzed. CPSS was compared to the Rapid Arterial Occlusion Evaluation (RACE), Los Angeles Motor Scale (LAMS), and the Vision, Aphasia, Neglect (VAN) assessment for LVO prediction. In this large sample of real-world prehospital patient encounters, the CPSS demonstrated similar predictive performance characteristics compared to the RACE, LAMS, and VAN for detecting LVO stroke. There were 13,596 prehospital records with one or more documented stroke scales of interest. Among these, 4,228 patients were diagnosed with stroke. Over half (57%, n = 2,415) of patients diagnosed with stroke experienced an acute ischemic stroke. Of patients with ischemic stroke, 26% (n = 628) were diagnosed with LVO. A CPSS score of 2 or higher demonstrated sensitivity =69% and specificity =78% for LVO. A RACE score of 4 or higher demonstrated sensitivity =63%, specificity =73%. A LAMS score of 3 or higher demonstrated sensitivity =63%, specificity =72% and a positive VAN score demonstrated sensitivity =86%, specificity =65%. Comparing the area under the ROC curve for each scale revealed no statistically significant differences in discriminative ability for LVO stroke.

7. **Nwanne T., Jarvis J., Barton D., Donnelly J.P., Wang H.E. Advanced airway management success rates in a national cohort of emergency medical services agencies, *Resuscitation*, Volume 146, 2020, Pages 43-49.**

The study objective was to characterize advanced airway management performance in a national cohort of EMS agencies. ESO data from January 1, 2011, to December 31, 2015 were analyzed. Advanced airway management techniques were categorized as conventional endotracheal intubation (cETI), neuromuscular blockade assisted intubation (NMBA-ETI), supraglottic airway (SGA), and cricothyroidotomy (needle and open). AAM success rates varied by airway technique and patient subset. Overall AAM success was 89.1% (95% CI: 88.8-89.3%) across all patients and techniques. Intubation success rates varied by technique; cETI (n = 38,004; 76.9%, 95% CI: 76.5-77.3%), NMBA-ETI (n = 6768; 89.7%, 88.9-90.4%). SGAs were used both for initial (n = 9461, 90.1% success, 95% CI: 89.5-90.7%) and rescue (n = 5994, 87.3% success, 95% CI: 86.4-88.1%) AAM. Cricothyroidotomy success rates were low: initial cricothyroidotomy (n = 202, 17.3% success, 95% CI: 12.4-23.3%), rescue cricothyroidotomy (n = 85, 52.9% success, 95% CI: 41.8-88%). AAM success rates varied by patient subset: cardiac arrest (n = 35,782; 91.7%, 95% CI: 91.4-92.0), medical non-arrest (n = 17,086; 84.7%, 84.2-85.2%); trauma (n = 4341; 84.3%, 83.1-85.3%); pediatric (n = 1223; 73.7%, 71.2-76.2%).

8. **Wang H.E., Donnelly J.P., Barton D., Jarvis J. Assessing advanced airway management performance in a National Cohort of Emergency Medical Services Agencies. *Annals of emergency medicine.* 2018 May 1;71(5):597-607.**

The study objective was to assess variations in advanced airway management and conventional intubation performance in a national cohort of EMS agencies. ESO data from January 1, 2011, to December 31, 2015 were analyzed. EMS advanced airway management and initial conventional intubation performance varied widely. During the study period, there were 550 EMS agencies performed 57,209 advanced airway management procedures. Among 401 EMS agencies with greater than or equal to 10 advanced airway management procedures, there were a total of 56,636 procedures. Median reliability-adjusted and risk-standardized EMS agency advanced airway management success was 92.9% (interquartile range 90.1% to 94.8%; minimum 58.2%; maximum 99.0%). There were 56 advanced airway management low-performing and 38 high-performing EMS agencies. Among 342 agencies with greater than or equal to 10 initial conventional intubations, there were a total of 37,360 initial conventional intubations. Median

reliability-adjusted and risk-standardized EMS agency initial conventional intubation success was 77.3% (interquartile range 70.9% to 83.6%; minimum 47.1%; maximum 95.8%). There were 64 initial conventional intubation low-performing and 45 high-performing EMS agencies.

9. Jarvis, J., Barton, D., Wang, H.E., Defining the Plateau Point: When are further attempts futile in out-of-hospital advanced airway management? Resuscitation, 2018. 130: p. 57-60.

The study objective was to characterize the number of attempts required to achieve advanced airway management success. ESO data from January 1, 2011 and December 31, 2015 were analyzed. There were 57,209 patients who had at least one Advanced Airway Management attempt included in the analysis. Results indicated that Multiple attempts were often needed to accomplish successful advanced airway management. The number of attempts needed to accomplish advanced airway management varied by advanced airway management technique with cardiac arrest intubation having a success plateau of 4 attempts to reach 91.5% overall success, medical non-arrest intubation having a success plateau of 3 attempts to reach 79.2% overall success, traumatic non-arrest intubation having a success plateau of 3 attempts to reach 75.8% overall success, rapid sequence intubation having a success plateau of 4 attempts to reach 95.8% overall success, sedation-assisted intubation having a success plateau of 3 attempts to reach 85.3% overall success, and supraglottic airways having a success plateau of 3 to reach 92.8% overall success.

PUBLISHED/PRESENTED ABSTRACTS

1. **Fernandez, AR., Crowe, RP., Bourn, S., Myers, B. Evaluating Prehospital Use of Personal Protective Equipment During the COVID-19 Pandemic. Accepted for presentation at the Prehospital Care Research Forum International Scientific Symposium at EMS World Expo 2020 and The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to describe the use and reuse of PPE among EMS providers during the COVID-19 pandemic. All 9-1-1 records from the national ESO Data Collaborative from March 5–June 15, 2020 with a documented EMS provider primary or secondary impression indicating COVID-19 were included. PPE was considered to have been used during the encounter if any of the above-mentioned PPE articles were documented for at least one EMS provider listed on the prehospital care record. There were 34,984 records with a COVID-19 impression documented. Of those, 15% (5,263) did not have PPE documented. Among the 29,721 records with documented PPE, a mask (N95, surgical mask, or PAPR) was documented on 89% (26,529) of records. Of those, 82% (24,469) had documented N95 use, of which 42% (10,290) indicated reuse. Another 17% (5,261) recorded use of surgical masks, of which 42% (2,220) indicated reuse. PAPR use was documented on 3% (967) of records. Face shield use was documented on 19% of records (5,537), of which 37% (2,027) indicated reuse. Finally, eye protection was documented on 88% (26,175) of records with documented PPE.

2. **Harris, M; Fische, J; Crowe, R; D'Acunto, S; Adalgais, K; Anders, J. Applying a Set of Termination of Resuscitation Criteria to Pediatric Out-of-hospital Cardiac Arrest. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to apply a set of pediatric Termination of Resuscitation (pTOR) criteria in a large national cohort and examine the test characteristics associated with its accuracy in predicting return of spontaneous circulation (ROSC) after pediatric out of hospital cardiac arrest (POHCA). Data were obtained from the ESO Data Collaborative from January 1, 2019 to December 31, 2019. Patients ages 0-18 treated by EMS with cardiac arrest were included. Those suffering from traumatic cardiac arrest were excluded. The Maryland criteria allows for consideration of pTOR after medical POHCA for patients 0-17 years with asystole after 30 minutes of resuscitative efforts on scene, the administration of epinephrine, and an end-tidal CO₂<15 mmHg. A total of 1,762 patients were evaluated, with 1,475 meeting inclusion criteria. The Maryland pTOR rule was highly specific (99% specificity, 4% sensitivity, Positive Predictive Value 96%, and Negative Predictive Value 24%), although 2 patients who achieved ROSC would have met the criteria for termination of resuscitation.

3. **Rodriguez, E; Baade, H; Crowe, R; Myers, B; Wampler, D. Measuring the Overuse of Helicopter Air Ambulances for Transport of Trauma Patients. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to measure the over-triage rate in Helicopter air ambulance (HAA) use for trauma transport. All 9-1-1 records from the national ESO Data Collaborative from January 1, 2018 to December 31, 2018 were included. Major trauma activation criteria were defined using available discrete data elements: systolic blood pressure<90 mmHg; respiratory rate<10 or>29; GCS<14; penetrating wound to head, neck, or torso; amputation; or pelvis injury. The validated Rapid Emergency Medicine Score (REMS) was used to evaluate baseline prehospital patient acuity. There were 691,901 trauma responses in the study period and 1% (5,984) were transported by HAA. No major trauma activation criteria were documented for 57% (3,448) of HAA patients. The median initial prehospital REMS score for patients transported by HAA without

documented trauma activation criteria was 3 (IQR: 2-6) compared to 7 (IQR: 4-10) among HAA patients with at least one criterion ($p<0.001$). -in-3 HAA transports without activation criteria originated in urban settings, suggesting time savings may have been limited.

- 4. Crowe, RP., Bourn, S., Fernandez, AR., Myers, B. Initial Prehospital Rapid Emergency Medicine Score to Predict Emergency Department and Hospital Dispositions of EMS Patients. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to assess predictive characteristics of initial prehospital Rapid Emergency Medicine Score (REMS) for ED and hospital dispositions. This retrospective analysis used linked prehospital and Health Data Exchange data from the ESO Data Collaborative from January 1, 2019 to December 31, 2019. Initial REMS (0-26) was calculated using age, pulse rate, mean arterial pressure, respiratory rate, oxygen saturation, and Glasgow Coma Scale. Patients <18 and cardiac arrests prior to EMS arrival were excluded. Overall, 62% (n=304,234) of patients were discharged from the ED, 36% (n=178,600) were admitted, 2% (n=10,697) were transferred, and 0.2% (n=960) died in the ED. Median REMS of discharged patients was 5 compared to 7 among admissions and 11 among patients who died in the ED ($p<0.01$). A REMS cut-point of >5 demonstrated optimal statistical prediction for admission or ED mortality (AUROC:0.69). REMS>5 demonstrated a three-fold increase in odds of admission or ED mortality (OR: 3.28, 95%CI: 3.24-3.32). Median REMS for discharged patients was 7 and 9 for patients who died. Among admitted patients, initial prehospital REMS>5 was associated with a 3-fold increase in odds of hospital mortality (OR:3.02, 95%CI:2.81-3.24).
- 5. Crowe, R; Pepe, P; Fernandez, AR; Bourn, S; Manifold, C; Myers, B. Comparison of Benzodiazepines, Ketamine and Antipsychotics for Prehospital Sedation of Patients Experiencing Behavioral Health Emergencies with Combativeness. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to compare the relative safety of benzodiazepines, ketamine and antipsychotics among patients experiencing out-of-hospital behavioral emergencies with combativeness (BHE-C) using a large nationwide database. A retrospective 2019 calendar year analysis of BHE-C records from the ESO Data Collaborative was performed including subsets of records with linked Health Data Exchange emergency department (ED) and hospital outcomes. BHE-C patients were identified by EMS impression and/or documented signs/symptoms. Prehospital sedation was defined as intramuscular or intranasal administration of a benzodiazepine, ketamine, or an antipsychotic as the first medication provided. Outcomes included prehospital noninvasive positive pressure ventilation (NIPPV), advanced airway placement, and ED/hospital disposition. Fewer than 1 in 5 patients experiencing BHE-C received prehospital sedation and benzodiazepines were used most frequently. Ketamine was associated with more ventilation and advanced airway assistance, but no differences were observed with regard to in-hospital deaths and no deaths occurred in the prehospital or ED settings.
- 6. Walter, D; Chan, HK; Crowe, R; Osborn, L; Jarvis, J; Wang, H. Effect of Prehospital Noninvasive Positive Pressure Ventilation for Rescue of Acute Dyspnea. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to characterize the association of out-of-hospital noninvasive positive pressure ventilation (NIPPV) with improvement of dyspnea in a national EMS cohort. Data were obtained from the ESO Data Collaborative from January to December 2018. Acute dyspnea was defined as adults (age≥18 years) with initial respiratory rate (RR) ≥30 breaths/minute (bpm) and EMS clinical impression of respiratory emergency. The primary outcome was change in RR, censored at 90 minutes of treatment. Of the 5,172,504 adult 911 responses, 33,585 were included with acute dyspnea, including 8,750 (26.1%) NIPPV and 24,835 (73.9%) non-NIPPV. In this multicenter series of out-of-hospital acute dyspnea, NIPPV was not associated with improved RR. Median treatment durations were: NIPPV 23.3min (IQR 16.5-32.1), non-NIPPV 23.6 min (IQR 16.3-32.8).

7. Huebinger, R; Stilgenbauer, H; Jarvis, J; Ostermayer, D; Schulz, K; Wang, H. Video Laryngoscopy for Out-of-Hospital Cardiac Arrest. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.

The study objective was to evaluate the association between video laryngoscopy (VL) with first pass success and ROSC. This study used the data from January 1, 2018 to December 31, 2018 obtained from the ESO Data Collaborative. All patients ≥ 18 years of age were included. Compared to direct laryngoscopy (DL), VL had a lower rate of bystander CPR (41.4% v 36.1%, $p < .001$), but other characteristics were similar between the groups. VL had a higher first pass success rate than DL (75.1% v 69.5%, $p < .001$). Using a mixed model analysis, VL was associated with a higher rate of first pass success (OR 1.5, CI 1.3-1.6), but VL was not associated with improvement in ROSC (OR 1.1, CI 0.97-1.2) or sustained ROSC (OR 1.1, CI 0.9-1.2).

8. Dean, B; Crowe, R; Fernandez, AR; Bourn, S; Myers, B. Initial Prehospital Glasgow Coma Scale and its Components to Predict Mortality among Trauma Patients. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.

The study objective was to assess predictive performance of initial prehospital GCS and its components for mortality among trauma patients. This was a retrospective analysis of 911 records for adult trauma patients from 1/1/2019-12/31/2019 and hospital disposition within the ESO Data Collaborative. Patients with penetrating trauma were excluded. Receiver operating curves for total GCS, the eye component (GCS_e), verbal component (GCS_v) and motor component (GCS_m) were constructed and area under these curves (AUROC) was measured to compare predictive values of the GCS and its components for mortality. AUROC for total GCS was 0.74 (95%CI: 0.72-0.76), 0.67 (0.65-0.69) for GCS_e, 0.73 (0.72-0.75) for GCS_v and 0.69 (0.67-0.70) for GCS_m. Initial prehospital GCS_m and GCS_e components demonstrated similar predictive characteristics for mortality compared to total GCS. The use of these two simplified components of the GCS may be a prehospital tool to identify patients with increased mortality risk.

9. Ashburn, N; Snively, A; Scheidler, J; Angi, R; Crowe, R; McGinnis, H; Hiestand, B; Miller, C; Mahler, S; Stopyra, J. Disparities in Emergency Medical Services Times for Rural Patients with Acute Cardiac Complaints. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.

The study objective was to quantify rural and urban differences in EMS time intervals for patients with cardiac problems. The ESO Data Collaborative was queried for 911 calls with an impression or chief complaint of a cardiac problem among adults (age ≥ 18) from 1/1/2013-6/1/2018. The primary outcome was total prehospital time, defined as dispatch to hospital arrival. Secondary outcomes included response time (dispatch to scene arrival), scene time (scene arrival to depart scene), and transport time (depart scene to hospital arrival). The median total prehospital, response, scene, and transport times were 36 (IQR 28-47), 5 (IQR 3-9), 16 (IQR 12-21), and 13 (IQR 8-20) minutes, respectively. After adjusting for age, sex, race, response priority, and stability, the total prehospital time on average was 16.22 (95%CI 14.61-17.82) minutes longer for rural patients than urban patients. Similarly, on average response time was 5.32 (95%CI 4.76-5.87) minutes longer, scene time 0.45 (95%CI 0.22-0.69) minutes longer, and transport time 10.57 (95%CI 9.34-11.79) minutes longer for rural patients.

10. Miller, M; Watanabe, B; Brown, L. Are there gender or racial disparities in EMS-administered sedation among patients in police custody? The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.

The study objective was to explore whether racial disparities exist in the frequency of EMS-administered sedation for patients in police custody. This study used the data from January 1, 2018 to December 31, 2018 obtained from the ESO Data Collaborative. Inclusion criteria were: (1) EMS requested by police; (2) response by a paramedic level agency; and (3) scene, transport

or disposition data suggesting the patient was in custody or otherwise under police control. Additionally, sedation in the subset of patients with a chief complaint, primary impression, secondary impression, treatment protocol, or barrier to care entry presumptively suggesting the patient was combative were explored. Sedation was defined as documented administration of ketamine, lorazepam, midazolam, propofol, haloperidol or droperidol. There were 50,542 law enforcement requests for EMS response for in-custody patients that were attended by a paramedic level agency. There were 532 (1.1%) instances of sedation. The proportion of in-custody males and females who received sedation was similar, (1.2% vs.1.0%, $p=0.116$), as were the proportions of White (1.2%), Black (1.1%) and Hispanic (1.0%) patients ($p=0.330$). There were 11,007 (22%) responses involving presumptively combative patients, with 289 (2.6%) receiving sedation. The lack of association between race/ethnicity and sedation persisted in the subset of combative patients ($p=0.779$), but combative male patients were more likely than combative female patients to receive sedation (3.1% vs. 1.8%, $p<0.001$).

11. Miller, M; Watanabe, B; Robinson, E; Brown, L. Evaluating the Efficacy and Safety of Ketamine Administration for Prehospital Pain Control. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.

The study objective was to explore the efficacy and safety of ketamine, in comparison with morphine and fentanyl, when used solely for analgesia in isolated, non-cardiorespiratory painful conditions. This study used the data from January 1, 2018 to December 31, 2018 obtained from the ESO Data Collaborative. Inclusion criteria were: a 911 scene response; age \geq 18 years; an initial complaint or use of a treatment protocol indicating a painful condition; prehospital administration of ketamine, fentanyl or morphine; and first and last pain scale and GCS data available. Patients were excluded if they received a combination of medications, or if there were indications medication administration could have been for airway management or agitation control. In pairwise comparisons, all three groups differed from each other (all $p<0.001$). Most patients had no change in GCS, but ketamine more often reduced GCS by 2 or more points ($n=100$, 9.5%) than fentanyl ($n=112$, 0.2%) or morphine ($n=19$, 0.2%), and the distributions of GCS changes differed across the three groups ($p<0.001$). In pairwise comparisons, ketamine decreased GCS more than fentanyl ($p<0.001$) and morphine ($p<0.001$); GCS changes did not differ for the morphine and fentanyl groups ($p=0.721$).

12. Fernandez, AR; Crowe, R; Bourn, S; Myers, B. National Description of Prehospital Ketamine Administration including Patient Outcomes.

The study objective was to describe prehospital ketamine administration and patient outcomes using a large national database. This retrospective observational study included all 9-1-1 responses, from the national ESO Data Collaborative, with prehospital ketamine administration for all patients, except cardiac arrest prior to EMS arrival, from 1/1/2019 to 12/31/2019. Hospital outcomes were obtained from ESO Health Data Exchange data. There were 15,204 prehospital ketamine administrations among 11,291 patients. Median total dose was 100mg (interquartile range: 35-300mg). EMS-PIs were 49% (5,575) pain/trauma, 34% (3,795) AMS, 13% (1,454) TCI, 2% (248) seizure, and 2% (219) other. Greater than 99% (11,274) were transports/assists/transfers of care to other EMS, <1% were released on scene (9) or dead on scene (8). There were 18% (2,030) with linked ED dispositions. Among those, 53% (1,068) were admitted, 40% (822) were discharged from the ED, 5% (92) transferred, 2% (34) expired in the ED, and <1% (14) AMA. Mortality status was unknown at the end of the study period for 7% (152). Of the 93% (1,878) with known mortality status, 94% (1,757) were alive and 6% (121) died. One death was excluded because physician review revealed that ketamine was never administered. Among those who had an advanced airway, 30% (46) died. Physician review determined ketamine could not be excluded as a contributing factor to death in 0.3% (6/1,878).

13. Harris, M; Crowe, R; D'Acunto, S; Anders, J; Adelgais, K; Fische, J. Combining traditional biostatistical analysis with natural language processing to identify new factors associated with

Return of Spontaneous Circulation after Pediatric Out of Hospital Cardiac Arrest. The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual. The study objective was to use natural language processing (NLP) analysis of the EMS narrative and standard biostatistics in a large national EMS database and examine factors associated with prehospital return of spontaneous circulation (ROSC) in Pediatric out-of-hospital cardiac arrests (POHCA). This study used the data from January 1, 2019 to December 31, 2019 obtained from the ESO Data Collaborative for patients 0-18 years of age. There were 1,825 episodes of POHCA. ROSC after POHCA is associated with having an EMS-witnessed arrest and an initial shockable EKG rhythm. EMS notes reveal additional clues to potential futile resuscitations such as rigor and lividity.

- 14. Crowe, RP., Fernandez, AR., Bourn, S., Myers, B. Assessing the Impact of the COVID-19 Pandemic on EMS Transport Patterns for Patients with Suspected Acute Coronary Syndrome. Oral presentation at the Prehospital Care Research Forum International Scientific Symposium at EMS World Expo 2020 and The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to describe changes in EMS use and transport patterns for patients with suspected ACS during the COVID-19 pandemic compared to a control period one year prior. This retrospective analysis used prehospital records from the ESO Data Collaborative. The authors compared responses for patients with suspected ACS from the first three months of the pandemic (study period: March 1–May 31, 2020) to the previous year (control period: March 1–May 31, 2019). Only agencies contributing records in both time periods were included. Total 9-1-1 call volume decreased 5% between the control period (1,131,399) and study period (1,071,868). Nontransports increased from 17% to 19% of all encounters ($p < 0.001$). Total encounters for suspected ACS decreased by 16% (67,697 to 56,969). Suspected ACS encounters resulting in nontransport increased from 6% to 9% ($p < 0.001$). Controlling for age and race/ethnicity, females with suspected ACS were less likely to be transported in the study period (aOR 0.76, 95% CI 0.72–0.81) and control period (0.81, 0.75–0.94) compared to males. Compared to white non-Hispanic patients, Hispanic patients were less likely to be transported during the study period (0.82, 0.74–0.91) and control period (0.84, 0.75–0.94). Black non-Hispanic patients were less likely to be transported during the study period only (0.91, 0.84–0.97).

- 15. Fernandez, AR., Myers, B., Crowe, RP., Bourn, S., Mills, M. A Descriptive Assessment of Prehospital Ketamine Administration Using a Statewide Data Repository. Poster presentation at the Prehospital Care Research Forum International Scientific Symposium at EMS World Expo 2020 and The annual meeting of the National Association of Emergency Medical Service Physicians. 2021. Virtual.**

The study objective was to describe patients who received prehospital ketamine in West Virginia. ESO state repository data was used for this analysis. The study included all West Virginia 9-1-1 patients who received prehospital ketamine from Jan. 1–Dec. 31, 2019. West Virginia protocols allow ketamine administration for pain and excited delirium. EMS provider impressions were categorized as pain/injury, altered mental status (AMS)/behavioral, and other. In 2019 there were 154,906 West Virginia 9-1-1 patients, and 173 (0.1%) received prehospital ketamine. In all, 62% (74) of patients with pain/injury impressions, 33% (40) with AMS/behavioral, and 6% (7) with other received ketamine. Ketamine for pain/injury was administered more often in rural areas, while ketamine for AMS/behavioral impressions was more frequent in urban areas. Those with pain/injury were older than those with AMS/behavioral impressions.

- 16. Fernandez, AR., Crowe, RP., Bourn, S., Myers, B. A Comparison of EMS Patients Diagnosed with COVID-19 Before and After Reopening in the United States of America. Oral presentation at the Prehospital Care Research Forum International Scientific Symposium at EMS World Expo 2020.**

The study objective was to compare EMS encounter and demographic characteristics of patients diagnosed with COVID-19 before and after the first reopening. All 9-1-1 patients from the national ESO Data Collaborative who had a hospital ICD-10 diagnosis of COVID-19 were included. For the analysis, March 15–April 30, 2020, represented “before reopening”; May 1–June 15, 2020, represented “after reopening.” There were 1,844 COVID-19-diagnosed 9-1-1 patients before reopening and 1,765 after reopening. The median age before reopening (69; interquartile range [IQR] 55–81) was significantly ($p < 0.01$) higher than after reopening (64.5; IRQ 50–78). More patients were less than 40 years old after reopening (18%, 326 vs. 24%, 421, $p < 0.001$). EMS patients diagnosed with COVID-19 were younger after the easing of stay-at-home orders. Also after reopening, more patients were reported to be Hispanic/Latino or other race, and slightly more patients were transported from homes/residences and healthcare facilities.

17. Robinson, E.J., Watanabe, B., Brown, L.H. Prehospital Ketamine Administration for Pain Control Does Not Prolong Emergency Department Length of Stay. The annual meeting of the Society for Academic Emergency Medicine. 2020. Virtual Meeting

The study objective was to compare ED length of stay among EMS patients who received prehospital ketamine, fentanyl or morphine specifically for pain control. The 2018 ESO research dataset was used for this analysis. There were 10,493 patients that met inclusion criteria. Of those, 131 received ketamine, 8,809 received fentanyl, and 1,553 received morphine. Median (IQR) ED length of stay was 3.6 (2.6-6.1) hours for patients who received ketamine, 3.8 (2.7-5.5) hours for patients who received fentanyl, and 4.1 (2.7-6.2) hours for patients who received morphine ($p < 0.001$). In post-hoc pairwise comparisons, patients who received morphine had significantly longer ED length of stay than patients who received fentanyl ($p < 0.001$); there was no significant difference in ED length of stay for patients who received ketamine vs. morphine ($p = 0.131$), or for patients who received ketamine vs. fentanyl ($p = 0.875$).

18. Houston, S., Dean, B., Taylor, S., Howell, S., Cornelius, C. Pediatric CARE (Cardiac Arrest Resuscitation by EMS). ESO Wave 2020. 2020. Austin, TX.

The study objective was to examine the effect of determinants on the likelihood of achieving return of spontaneous circulation in pediatric out-of-hospital cardiac arrest. The ESO 2017 Research Dataset was used for this analysis. Witnessed arrests were more likely to achieve return of spontaneous circulation. CPR feedback devices showed statistical significance in achieving return of spontaneous circulation in pediatric out-of-hospital cardiac arrest when utilized. Caucasian pediatric out-of-hospital cardiac arrest and early epinephrine administration also improved the likelihood of return of spontaneous circulation.

19. Moore, A., Clemency, B.M., Brown, L.H., Vital Signs Are an Effective Predictor of EMS-witnessed Cardiac Arrest. ESO Wave 2020. 2020. Austin, TX.

The study objective was to explore whether an existing vital signs-based risk assessment score or a simple count of abnormal vital signs (level of consciousness; heart rate; respiratory rate; systolic blood pressure) can identify patients at risk for EMS-witnessed arrest. The ESO 2018 Research Dataset was used for this analysis. This study compared the ability of the Modified Early Warning Score (based on first recorded vital signs, excluding temperature) and the count of abnormal first recorded vital signs to differentiate adult non-traumatic EMS-witnessed arrest patients from non-arrest but emergently transported patients. Vital sign-based assessments can help identify patients at risk for EMS-witnessed arrest. The absence of at least 3 normal vital signs indicates increased risk of EMS-witnessed arrest. The study found that using the count of abnormal vital signs sacrifices some sensitivity but is easier than calculating the Modified Early Warning Score.

20. Crowe, R.P., Myers, B., Fernandez, A.R., Bourn, S. McMullan, J.T. Prehospital Performance of the Cincinnati Prehospital Stroke Scale Compared to LVO-specific Instruments for Identifying LVO

Stroke. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to determine whether newly-developed LVO stroke scales offer a clinically-meaningful advantage over the Cincinnati Prehospital Stroke Scale (CPSS). The 2018 ESO Health Data Exchange research dataset was used for this analysis. CPSS was compared to the Rapid Arterial Occlusion Evaluation (RACE), Los Angeles Motor Scale (LAMS), and the Vision, Aphasia, Neglect (VAN) assessment for LVO prediction. In this large sample of real-world prehospital patient encounters, the CPSS demonstrated similar predictive performance characteristics compared to the RACE, LAMS, and VAN for detecting LVO stroke.

21. Crowe, R.P., Myers, B., Fernandez, A.R., Myronenko, V., Bourn, S. McMullan, J.T. Factors Associated with Failure to Document a Prehospital Stroke Screen in Patients Diagnosed with Stroke/TIA. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to describe factors associated with reduced likelihood of EMS documenting a stroke screen among a cohort of patients diagnosed with stroke. The 2018 ESO Health Data Exchange research dataset was used for this analysis. Of 13,323 patients with hospital diagnosed stroke/TIA, 51% (n = 6,824) were acute ischemic stroke (AIS), 24% were nontraumatic intracranial hemorrhages (ICH) (n = 3,236), 19% were TIA (n = 2,572), and 5% involved multiple stroke types (n = 691). Approximately one-third of EMS patients with hospital-diagnosed stroke/TIA did not have a prehospital stroke screen documented. Younger age, ICH, and presence of injury were associated with reduced odds of stroke screen documentation.

22. Crowe, R.P., Fernandez, A.R., Schroeder R., Bourn, S., Myers, B. Evaluating the Utility of Prehospital Shock Index and Modified Shock Index to Predict Hospital Sepsis and Septic Shock Diagnosis. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to evaluate initial prehospital Shock Index (SI), Modified Shock Index (MSI), and Systolic Blood Pressure (SBP) as predictors of hospital sepsis/septic shock diagnosis. The 2018 ESO Health Data Exchange research dataset was used for this analysis. Elevated initial prehospital SI and MSI demonstrated stronger associations with sepsis diagnosis compared to SBP < 90 in this population.

23. Fernandez, A.R., Crowe, R.P., Bourn, S., Myers, B. Prehospital Recognition of Patients Diagnosed with Sepsis and Septic Shock. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to estimate EMS sepsis recognition and describe prehospital characteristics of patients diagnosed with sepsis/septic shock. The 2018 ESO Health Data Exchange research database was used for this analysis. There were 325,558 adult non-trauma patients with linked EMS-hospital records, 16,881 (5.2%) were diagnosed with sepsis. Of these, 18.6% (3,144/16,881) were diagnosed with septic shock. Sepsis and septic shock patient vital signs were consistent with their diagnosis. Prehospital temperature was not documented consistently. Sepsis/Septicemia was infrequently documented as the primary or secondary impression.

24. Fernandez, A.R., Crowe, R.P., Bourn, S., Myers, B. Variation in Use of Lights and Sirens for Patient Transport: A National, Agency-Level Comparison. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to describe variability in L&S use for scene-to-hospital 9-1-1 transports among a national cohort of EMS agencies. The 2018 ESO research dataset was used for this analysis. There were 1,190 EMS agencies analyzed, representing 3,634,564 scene-to-hospital transports that met inclusion criteria. Overall, 13.8% (499,714/3,632,564) of 9-1-1 patients were transported using lights and sirens. Almost half of EMS agencies used lights and sirens for

10% or less of scene-to-hospital 9-1-1 patient transports. Nevertheless, approximately 1 out of 8 agencies had documented lights and sirens use for more than 50% of transports.

25. Jarvis, J., Johnson, B., Crowe, R.P. Prehospital Epidemiology and Treatment of Patients with Atraumatic Headache. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to describe the epidemiology and treatment of prehospital atraumatic headaches in adults. The secondary objective was to describe meaningful pain reduction by commonly administered medications. The 2018 ESO research dataset was used for this analysis. Of the 5,977,612 emergency responses, 66,235 (1.1%) had an impression of headache/migraine and 34,763 (52.5%) met inclusion criteria. Prehospital pain scores were documented infrequently. Less than one-fifth of patients with initial pain scores >5 received medication.

26. Escott, M.E., Crowe, R.P., Brown, L. An Epidemiological Description of Traumatic Out-of-Hospital Cardiac Arrest. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to describe EMS encounters for traumatic out-of-hospital cardiac arrests (Tr-OOHCA) among a nationwide cohort of EMS systems, and identify factors associated with return of spontaneous circulation (ROSC) and survival. The 2018 ESO research dataset was used for this analysis. ROSC was documented in 19.9% of cases. In this large US-based dataset, resuscitation of Tr-OOHCA was not futile, with ROSC and survival rates similar to those for all-rhythm medical OOHCA. Although ROSC appears more likely in some patient subgroups, no demographic or clinical Tr-OOHCA subgroup had ROSC rates near zero.

27. Stopyra, J., Crowe, R.P., Snavelly, A., Page, N., Ashburn, N., Foley, K., Miller, C., Mahler, S. Rural Health Time to Care Disparities for Prehospital Patients with Suspected STEMI. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to compare rural vs. urban time intervals among a national cohort of prehospital patients with suspected STEMI. The 2018 ESO research dataset was used for this analysis. Of 3,480,473 adult 9-1-1 transports, 8,079 had a provider STEMI impression and were included in the analysis. Most responses (79%, n = 6,382) occurred in urban settings. In this large national dataset of patients with suspected STEMI, rural patients had longer critical prehospital-hospital time intervals compared to urban patients. Rural patients were less likely to have EMS arrival-destination transport times under 60 minutes and had longer response and total EMS times.

28. George T.P., Chan, H.K., Crowe, R.P., Jarvis, J., Jansen, J., Wang, H. Characteristics of Out-of-Hospital Shock in a National Cohort of Emergency Medical Services Agencies. The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to describe the clinical characteristics and course of shock care in a national cohort of EMS agencies. The 2018 ESO research dataset was used for this analysis. Among 6,156,895 adult 9-1-1 responses from 1,289 EMS agencies, shock was present in 62,876 (1.02%; 95%CI:1.01–1.03), including 54,239 (86.3%) medical and 5,978 (9.5%) traumatic, and 2,650 unknown. In this national series, 1 of every 100 EMS encounters involved shock. Approximately 1 of every 10 shock patients did not improve with EMS care.

29. Jarvis J., Hamilton V., Taigman M., Brown L. Results of Using Red Lights and Sirens for Emergency Ambulance Calls: How Often Are Potentially Life-Saving Interventions Performed? The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.

The study objective was to identify and describe the frequency and nature of 9-1-1 calls that result in potentially life-saving interventions (pLSI) at any time during the call and within 6 minutes of EMS arrival. The 2018 ESO research dataset was used for this analysis. There were 5,393,570 calls from 1,199 agencies included in the analysis. The majority (86.1%) of calls utilized RLS, yet few (5.0%) resulted in pLSI. In this large national dataset, RLS responses were very common (86%) yet potentially lifesaving interventions were infrequent and rarely performed within 6 minutes of arrival on scene.

- 30. Van Vleet, L., Burton, B., Crowe, R.P., Page, D., Wang, H. A Descriptive Assessment of EMS Encounters for Patients Experiencing Behavioral Health Emergencies. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA. and the annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.**

The study objective was to describe characteristics of EMS patients experiencing behavioral health emergencies. The 2018 ESO Health Data Exchange research database was used for this analysis. Inclusion criteria consisted of 9-1-1 responses for adult patients (older than 18 years) with a documented EMS provider primary or secondary impression of a behavioral or psychiatric etiology transported to the ED. Substance abuse and overdose were specifically excluded. A behavioral health emergency was present in 213,410 (4%) of responses. There were 21,901 (10%) excluded because the patient age less than 18. Of the remaining 191,509 encounters, there were 146,124 (76%) transports by EMS. Median age was 41 (IQR 29–56), 51% were male, 69% were white (non-Hispanic) and 25% were black (non-Hispanic). Hospital outcome data was available for 15,500 encounters (11%). Of these, 51% (7,948) were discharged home in 24 hours or less.

- 31. Wampler, D., Tenley, L., Crowe, R.P., Jarvis, J., The Epidemiology of EMS-Witnessed Cardiac Arrest in a U.S. Patient Cohort. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA. and The annual meeting of the National Association of Emergency Medical Service Physicians. 2020. San Diego, CA.**

The study objective was to describe the epidemiology of EMS-witnessed cardiac arrests. The 2018 ESO research dataset was used for this analysis. Of the emergency responses for documented cardiac arrests among adult patients, EMS witnessed 8,014 (13%). Among EMS-witnessed cardiac arrest patients, median age was 65 (IQR 53–76), 71% were white (non-Hispanic), and 60% were male. Presumed etiology of EMS-witnessed arrests included cardiac (54%), followed by respiratory (25%), trauma (12%), and drug overdose (2%). Initial arrest rhythm was shockable in 21% of witnessed arrests, while PEA or asystole was documented in 73% of cases. Common locations where EMS-witnessed cardiac arrests occurred included residences (70%), streets/highways (10%), and nursing homes/assisted living centers (8%). Circulation was restored in 43% of cases.

- 32. Schroeder, R., Crowe, R.P., Myers, B., Bourn, S., Fernandez, A.R. Evaluating the Utility of Initial Prehospital Shock Index and Modified Shock Index to Predict Hospital Sepsis and Septic Shock Diagnosis. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.**

The study objective was to evaluate prehospital initial shock index and modified shock index as predictors of hospital sepsis diagnosis. The 2018 ESO Health Data Exchange research database was used for this analysis. All medical 9-1-1 responses with linked hospital diagnoses were included. Patients under 18 and those with traumatic injuries were excluded. Sepsis/septic shock diagnosis was defined using hospital ICD10 codes. Shock Index was calculated by dividing initial heart rate by SBP. Modified Shock Index was calculated by dividing initial heart rate by mean arterial pressure. Elevated Shock Index was defined as >1.0 and elevated Modified Shock Index was >1.3. Multivariable logistic regression models were used to evaluate Shock Index and Modified Shock Index as predictors of sepsis/septic shock, controlling for patient age, gender,

race/ethnicity, community size, and geographic region. Over a five-fold increase in odds of sepsis diagnosis was observed for patients with an elevated initial SI (aOR:5.30, 95%CI:5.08-5.52) or MSI (aOR:5.42, 95%CI:5.21-5.64). A nine-fold increase in odds of septic shock was observed for patients with an elevated SI (aOR:9.05, 95%CI:8.32-9.85) or MSI (aOR:8.61, 95%CI:7.92-9.36). Elevated Shock Index and Modified Shock Index were strongly associated with hospital sepsis diagnosis among this group of all EMS encounters for patients with a presumed medical etiology.

33. Alier, A., Kaye, S.P., Wilson, J.K., Wronski, R.A., Fernandez, A.R. Evaluating the Current EMS Workforce in South Carolina. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to describe the current EMS workforce in South Carolina with respect to patient contacts, number of agency rosters on which they appear, roles, and years of experience. ESO state repository data was used for this analysis. This cross-sectional evaluation included all certified South Carolina EMS professionals in 2019. There were 11,197 South Carolina EMS certified individuals in 2019. Of those, 3,138 (27.9%) were not listed on any agency rosters. There were 8,069 (72.1%) who appeared on at least 1 agency roster. Number of rosters ranged from 1 to 20 with a median of 1 (interquartile range [IQR]: 1-2). There were 1,757 (21.8%) individuals who appeared on a roster but, had no patient contact within the last 12 months. There were 7,823 field providers. Experience ranged from <1 to 47.1 years with a median of 5.2 (IQR: 2.4-11.3). There were 545 in management/operations. Experience ranged from <1 to 47 years with a median of 14.1 (IQR: 6.3-24.6). There were 360 in leadership/administration. Experience ranged from <1 to 47 with a median of 17.0 (IQR: 7.3-26.5). There were 29 educators. Experience ranged from 3.7 to 46.8 years with a median of 16.0 (IQR: 8.9-27.2).

34. Renkiewicz, G.K., VanVleet, L., Baggett, B., Elmore, A., Ross, M., Martin, M. Disparate Treatment of the Pediatric Diabetic Patient in the Prehospital Setting. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to identify disparities in the prehospital treatment of pediatric diabetic emergencies. The 2017 ESO research dataset was used for this analysis. Inclusionary criteria consisted of patients whose lowest blood glucose level was less than 70 mg/dL, had a total Glasgow Coma Score of 14 or less, and had a primary impression that suggested a potential blood glucose level abnormality. A primary impression of altered level of consciousness was statistically significant (OR 8.05, p=0.029) regarding the treatment of prehospital pediatric hypoglycemia. The study identified no discernable disparity in the treatment of prehospital pediatric diabetic patients filtered by age in years, weight, gender, or minority status.

35. Renkiewicz, G.K., Dean, B., Houston, S., Taylor, S., Howell, S., Cornelius, C. Pediatric Cardiac Arrest Resuscitation by EMS (CARE). The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to examine factors influencing the likelihood of achieving field return of spontaneous circulation in pediatric out-of-hospital cardiac arrest. The 2017 ESO research dataset was used for this analysis. Compared to unwitnessed arrests, patients were more likely to achieve return of spontaneous circulation when arrests were witnessed by a healthcare provider (OR 6.53, p=0.003), bystander (OR 2.94, p=0.001), or family member (OR 2.77, p=0.016). Field return of spontaneous circulation was also associated with Caucasian race (OR 2.39, p=0.004), use of CPR feedback device (OR 2.21, p=0.007), and quicker epinephrine administration (OR 0.98, p=0.042 per minute from 9-1-1 call received time to first epinephrine administration). The child age group (2-18 years) also exhibited improved odds of ROSC (OR 2.11, p=0.008).

36. Burchette, E., Hubble, M.W., Renkiewicz, G.K., Stallings, D., Tripp, H. Impact of Delayed Epinephrine Administration on Return of Spontaneous Circulation During Pediatric Out-of-

Hospital Cardiac Arrest. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to evaluate the effect of vasopressor administration delay on field return of spontaneous circulation in pediatric out-of-hospital cardiac arrest. The 2017 ESO research dataset was used for this analysis. Patients receiving advanced airway control prior to epinephrine administration had longer scene-arrival-to-pressor intervals (24.9 vs. 19.3 minutes, $p < 0.01$). Significant adjusted odds ratios for return of spontaneous circulation included call-receipt-to-pressor interval (per minute; OR 0.97, $p < 0.01$); patient age (per year; OR 1.06, $p < 0.01$); non-Caucasian race (OR 0.43, $p = 0.01$); and witnessed arrests (OR 2.88, $p < 0.01$). In addition, compared to arrests of cardiac etiology, arrests of respiratory (OR 2.42, $p = 0.01$) and other etiologies (OR 2.12, $p = 0.04$) were more likely to attain return of spontaneous circulation. An increased likelihood of return of spontaneous circulation was associated with an initial ECG of VF/VT or shockable AED rhythm (OR 3.06, $p < 0.01$), PEA (OR 5.97, $p < 0.01$), and unknown AED nonshockable rhythm (OR 8.42, $p = 0.03$) when compared to asystole.

37. Van Vleet, L., Baggett, B., Elmore, A., Ross, M., Martin, M. Likelihood of Bystander CPR in Pediatric Cardiac Arrest. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to determine the incidence of layperson CPR in witnessed pediatric cardiac arrest and demographic factors that may impact the likelihood of layperson efforts. The 2017 ESO research dataset was used for this analysis. Among the 269 pediatric patients included in the study, 54.8% received layperson CPR. Gender was the only factor that showed a statistically significant ($p = 0.048$) difference in the odds of bystanders to perform CPR, with females 2.05 times greater odds than males to receive layperson CPR. There was no difference in age, weight, race, and cardiac arrest etiology regarding performance of layperson CPR.

38. Renkiewicz, G.K., Tripp, H.E., Burchette, E., Stallings, D. A., Hubble, M.W. An Epidemiology of Pediatric Suicide Attempts. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to describe epidemiological and patient-related factors of a nationwide population of prehospital pediatric suicide attempts. The 2017 ESO research dataset was used for this analysis. Mean age was $15.5 \pm .05$ years with a range of 6–18. Patients identified as prepubescent (< 13 years) accounted for 15.3% ($n = 413$) of the sample. Average EMS response time was 11.75 ± 33.36 minutes, and 457 (16.9%) attempts had a traumatic component. Suicidal ideations without actual attempt were the highest subgrouping ($n = 990$; 36.7%), followed by nonspecific suicide attempt ($n = 414$; 15.3%), overdose ($n = 390$; 14.5%), lacerations ($n = 172$; 6.4%), and depressive symptoms ($n = 101$; 3.75%). Upon EMS arrival, 5 patients were observed to be in cardiac arrest. Of these, resuscitation was attempted on 2, and 1 achieved return of spontaneous circulation. Twelve patients were intubated.

39. Renkiewicz, G.K., Watkins, A., Collopy, K., Hoover, J., Tuttle, J. Impact of Pediatric Age Groups on Prehospital Intubation Success. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.

The study objective was to evaluate whether prehospital overall endotracheal intubation success varied based on patient age. The 2017 ESO research dataset was used for this analysis. Adolescents were the most commonly intubated age group ($n = 164$; 29.66%), followed by infants ($n = 160$; 28.93%), toddlers ($n = 82$; 14.82%), school-aged children ($n = 60$; 10.84%), preschoolers ($n = 45$; 8.13%), and neonates ($n = 42$; 7.59%). Compared to adolescents, neonates (OR 0.404; $p = 0.014$) and those patients not receiving paralytics were less likely to obtain overall endotracheal intubation success (OR 0.404; $p = 0.049$). Neither sex nor minority status were statistically significant predictors of ETI success.

- 40. Van Vleet, L., Baggett, B., Elmore, A., Ross, M., McNeil, M. Treatment Equity Among Pediatric Diabetic Patients in the Prehospital Setting. The Prehospital Care Research Forum International Scientific Symposium at EMS Expo. 2019. New Orleans, LA.**

The study objective was to identify disparity in prehospital treatment of pediatric diabetic emergencies. The 2017 ESO research dataset was used for this analysis. Inclusion criteria consisted of patients whose lowest blood glucose level was less than 70 mg/dL and had a total Glasgow coma score of 14 or less and a primary impression that may have been related to blood glucose level abnormalities. total of 36.7% (92) patients received an included treatment modality, and 63.3% (159) patients were not treated. This study identified no discernable disparity in treatment of prehospital pediatric diabetic patients when examined by age in years, weight, gender, or minority status.

- 41. Mills, M., Crowe, R.P., Myers, B., Wilson, J.K., Kaye, S.P., Fernandez, A.R. An Assessment of the Relationship between the Total Prehospital Naloxone Dose Administered and EMS Transport in West Virginia. The 2019 National Association of State EMS Officials Annual Meeting. 2019. Salt Lake City, UT. Awarded 1st Place Research Abstract.**

The study objective was to assess the relationship between the total dose of prehospital naloxone administered and EMS transport of suspected opioid patients to an emergency department in West Virginia. ESO state repository data was used for this analysis. All 9-1-1 calls where one or more doses of prehospital naloxone were administered in West Virginia from January 1, 2016 to December 31, 2017 were assessed. There were 613,011 total 9-1-1 call and 1.5% where the patient received prehospital naloxone in West Virginia during the study period. Of those, 82.2% were transported and 17.8% were not transported. The assessment of the relationship between total prehospital dose of naloxone and patient transport in West Virginia did not reveal a significant relationship. The average total dose for those who were not transported was 1.6 milligrams (standard deviation 0.7) with a median of 2 (interquartile range 1-2).

- 42. Wilson, J.K., Crowe, R.P., Myers, B., Ezzell, Zalkin, J., Nelson, R.D., Winslow, J., Fernandez, A.R. North Carolina EMS Providers' Experiences and Attitudes Regarding Workplace Violence and Safety. The 2019 National Association of State EMS Officials Annual Meeting. 2019. Salt Lake City, UT.**

The study objective was to assess the proportion of EMS providers in North Carolina who reported one or more forms of assault while on duty in the past 24 months and to identify demographic and work-related factors associated with the report of being assaulted. Secondly, EMS providers' attitudes regarding workplace safety and management of workplace assaults events were examined. All responses obtained from an online survey distributed via multiple listservs for EMS providers in North Carolina in June and July of 2018 were assessed. Over two-thirds of respondents indicated that they had been physically or verbally assaulted in the workplace in the last 24 months. Those who reported an assault in the last 24 months felt less safe at work and less able to manage physical violence. There was an increase in perceived ability to manage violence by those who had not experienced violence potentially indicating that providers are overconfident or unaware of potential threats.

- 43. Alier, A., Kaye, S.P., Crowe, R.P., Myers, B., Wronski, R.A., Wilson, J.K., Fernandez, A.R. An Assessment of EMS Longevity and the Current EMS Workforce in South Carolina. The 2019 National Association of State EMS Officials Annual Meeting. 2019. Salt Lake City, UT.**

The study objective was to describe the length of time EMS providers in South Carolina remain in the workforce and identify factors related to longevity. ESO state repository data was used for this analysis. All EMS providers who held an EMS certification in South Carolina from 1970 to 2019 were assessed. Those currently certified in South Carolina have similar years of EMS experience and are similar in age to those who are no longer certified. Currently certified individuals may be on the verge of leaving the field. Moreover, this study revealed that almost three-quarters of the South Carolina EMS workforce maintained their EMS certification for less

than 8 years, over 90% don't make it to 20 years of service and over 98% do not accumulate enough service time to retire from EMS. Females maintain EMS certification for fewer years compared to males and EMTs maintain certification for fewer years compared to paramedics.

44. Humlen-Ahearn, P., Hadland L., Crowe R.P., Brown L., Using Prehospital Screening Tools to Identify Large-Vessel Occlusion, in National Association of EMS Physicians. ESO Wave 2019. 2019: Austin, TX.

The study objective was to determine the test characteristics for commonly used prehospital stroke scales for detecting large-vessel occlusion. The 2017 ESO research database was used for this analysis. The study included all patients with both a stroke screening and health data exchange hospital outcome data. Large-vessel occlusion was identified using ICD-10 diagnosis. There were 1,712 patients with both stroke screening and HDE outcome data, 3% had documented large-vessel occlusion. Only 14% of the patients were assessed using RACE/LAMS. The sensitivity of RACE/LAMS was 100% (CI: 60%-100%) and the negative predictive value was 100% (CI: 97%-100%), but the specificity (53%, CI: 46%-59%) and positive predictive value (6%, CI: 2%-12%) were poor. Use of the LAMS/RACE > /4 stroke-screening tools or two or more screening characteristics by EMS is a poor predictor of large-vessel cerebral occlusions.

45. Jarvis, J., Biasatti M., Gonzales J., Johns D. Esmolol Use for Refractory Ventricular Fibrillation: A Prehospital Case Series, in National Association of EMS Physicians. ESO Wave 2019. 2019: Austin, TX.

The study objective was to describe the characteristics of patients in refractory VF treated with esmolol. ESO data from a single suburban EMS system was used for this analysis. Between October 2017 and June 2018, thirteen patients received esmolol 500 mcg/kg bolus followed by an infusion. There was no significant difference between the esmolol and non-esmolol groups on any variable evaluated in this study. The use of esmolol did not improve outcomes but it did decrease the proportion of patients transported with CPR in progress.

46. Waddell, M. Focused Stroke Education in Emergency Medical Services (EMS). 2019. ESO Wave 2019. Austin, TX.

The study objective was to determine if there was a significant difference in the number of stroke patients that bypassed local primary stroke centers prior to and after attending Advanced Stroke Life Support education. ESO data from a single county-based EMS system was used for this analysis. Three years of EMS clinical data prior to Advanced Stroke Life Support education was compared to three years of clinical data following Advanced Stroke Life Support education. Results from this study indicated that Advanced Stroke Life Support training did not reduce the likelihood of EMS providers by-passing local primary stroke centers.

47. Ashburn, N., Ryder C.W., Angi R.M., Snavely A.C., Nelson R.D., Bozeman W.P., McGinnis H.D., Winslow J.E., Stopyra J.P. One-Year Mortality After Receiving Prehospital Naloxone for Suspected Opioid Overdose, in Society for Academic Emergency Medicine. 2019: Las Vegas NV.

The objective of this study was to determine the one-year mortality rate of patients who receive prehospital naloxone from emergency medical services. ESO data from seven North Carolina county EMS agencies was queried for naloxone administration over a twenty-six-month period (1/2015-2/2017). There were 3,099 naloxone administrations. Nearly 15% of patients died within one-year of receiving prehospital naloxone.

48. Arkins, T., Sigle R., Page D., Crowe R.P. Barton D, Can 911 Dispatchers Reliably Identify Patients Suffering a Stroke?, in National Association of EMS Physicians 2019: Austin, TX.

The study objective was to evaluate the ability of a 911 dispatcher to reliably identify a patient who is suffering a stroke or transient ischemic attack. The 2017 ESO research database was used for this analysis. Only run types listed as 911 responses with health data exchange hospital outcomes of stroke or TIA were included. A total of 2,199 cases were identified for inclusion and

analysis. Dispatchers were able to correctly identify a stroke patient 39% of the time. Dispatchers are not able to reliably identify a patient suffering a stroke or TIA.

49. Burton, B., Van Vleet L., Crowe R.P., Page D., Barton D., Wang H., Disparities in Prehospital Analgesia for Trauma Patients in the United States, in Prehospital Care Research Forum EMS World Expo & National Association of EMS Physicians. ESO Wave 2019. 2018/2019: Nashville and Austin.

The study objective was to characterize differences by age, sex, race, and region in EMS analgesia administration to injured patients. The 2017 ESO research database was used for this analysis. There were 118,203 injured patients with pain score ≥ 7 and 9% received analgesia. EMS analgesia administration differs by age, sex, race and region. Average age among this injured patient population was 50 years and 43% were male. 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 less likely than White, non-Hispanic patients to receive analgesia (OR: 0.60, 95% CI: 0.56-0.63).

50. Jarvis, J., Phillips D., Crowe R.P. Response, Agency, and Patient Characteristics Associated with EMS Transport Rates, in Prehospital Care Research Forum EMS World Expo & National Association of EMS Physicians. 2018/2019: Nashville & Austin.

The study objective was to identify response, agency and patient characteristics associated with EMS transport rates. The 2017 ESO research database was used for this analysis. There were 2,786,615 electronic health records; 85% resulted in EMS transport by over 900 agencies. Compared to third service agencies, private agencies demonstrated 80% 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 transport (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:0.73-0.75). Compared to patients aged 18-39, patients in older patients had progressively greater odds of transport with each age group, the largest aOR being 2.62 (95%CI:2.59-2.65) for those over 79. Patients younger than 18 years had lower odds of transport (aOR:0.74, 95%CI:0.73-0.75).

51. Kordik, S., Smith C., Page D., Crowe R.P., Myers B., Wampler D. Increased Frequency of Adverse Events Observed after Ketamine Use for Psychiatric Emergency as Compared to Benzodiazepines and Antipsychotics, in Prehospital Care Research Forum EMS World Expo & National Association of EMS Physicians. 2018/2019: Nashville & Austin.

The study objective was to evaluate adverse events after administration of ketamine compared to benzodiazepines or antipsychotics in the prehospital treatment of psychiatric patients. The 2017 ESO research database was used for this study. The analysis included patients over 13 years experiencing a psychiatric emergency and receiving a single dose of ketamine, benzodiazepine, or antipsychotic. There were 3,020 patients included, 11% received ketamine, 71% received a benzodiazepine, and 17% received an antipsychotic. The adverse event rate for all psychiatric patients administered sedation was $\leq 11\%$. For psychiatric patients requiring treatment, those who received ketamine received significantly more airway management than patients who received a benzodiazepine or antipsychotic.

52. Jarvis, J., Wampler D., Wang H. First Pass Airway Success Rates Out-of-Hospital Advanced Airway Management in Adults and Children, in Prehospital Care Research Forum EMS World Expo & National Association of EMS Physicians. ESO Wave 2019. 2018/2019: Nashville & Austin.

The study objective was to compare advanced airway management first-pass success rates between adults and children. The 2017 ESO research database was used for this analysis. All patients receiving any advanced airway management attempts were included. Advanced airway

management was attempted on 29,369 patients including 28,846 (98.2%) adults and 523 (1.8%) children. endotracheal intubation first pass success was lower in children than adults (58.6% vs 72.7%). Supraglottic airway first pass success does not differ between children and adults (84.6% vs 89.8%).

53. Jarvis, J., Curtis L., Prehospital Use of Ketamine, Morphine or Fentanyl for the Management of Acute Pain Following Traumatic Injury, in Prehospital Care Research Forum, EMS World Expo & National Association of EMS Physicians. ESO Wave 2019. 2018/2019: Nashville & Austin.

The study objective was to compare the analgesic effects of low-dose ketamine, fentanyl, and morphine for the treatment of acute, traumatic pain in the prehospital environment. The 2017 ESO research database was used for this analysis. All patients >12 years old with an initial pain score of ≥ 5 and at least one subsequent pain score documented who were treated with ketamine, fentanyl, or morphine following traumatic injury were included. There were 35,906 analyzed, 80.0% received fentanyl, 18.2% received morphine, and 1.8% received ketamine. There was no significant difference in pain reduction when the ketamine group (84.8%) was compared to either the fentanyl group (85.8%) or the morphine group (83.6%), but fentanyl was associated with significant reduction in pain compared to morphine.

54. Jarvis, J., Phillips D., Crowe R.P. Characteristics of EMS Transport Refusal Following Glucose or Naloxone Administration, in Prehospital Care Research Forum EMS World Expo & National Association of EMS Physicians. ESO Wave 2019. 2018/2019: Nashville and Austin.

The study objective was to describe the characteristics of transport refusal among patients who received glucose, naloxone, or neither medication. The 2017 ESO research database was used for this analysis. The analysis included 2,778,921 electronic health records. Transport refusal rates were higher for those given glucose and lower for those given naloxone compared with those given neither. Overall, 14% of all responses resulted in transport refusal with 7% of those given naloxone, 39% given glucose, and 14% given neither drug refusing transport.

55. Jarvis, J., Barton D., Sager L., Nudell N. Benchmarking EMS Compass Stroke Performance Measures Using a Large National Dataset, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national stroke performance measure benchmarks including prehospital use of stroke screening tools and assessment of blood glucose levels among EMS stroke patients. Six and a half years of ESO data were analyzed. There were 168,854 patients who had an impression of acute stroke and were transported from the scene of a 9-1-1 call included in the analysis. Of those, 52.6% had a documented stroke scale and 83.1% had a documented glucose level. This was the first study to calculate national benchmarks for stroke related EMS Compass measures.

56. Jarvis, J., Barton D., Sager L., Nudell N. Benchmarking EMS Compass Performance Measures using a Large National Dataset: Pediatric Care, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national pediatric performance measures benchmarks including documentation of weights, SpO₂, Respiratory Rate, for those with any respiratory illness as well as at least one dose of beta-agonist given for those with asthma and an SpO₂ 90%. Six and a half years of ESO data were analyzed. There were 524,856 9-1-1 patients under 15 years of age included in the analysis with 54.8% having a documented weight. There were 43,067 children with a respiratory impression and 87.5% of these had at least one documented SpO₂ and Respiratory Rate. Of the 755 children with an impression of asthma and SpO₂ <90%, 84.1% received a beta-agonist. This was the first study to calculate national benchmarks for pediatric related EMS Compass measures.

57. Jarvis, J., Barton D., Sager L., Nudell N. Benchmarking EMS Compass Cardiac Performance Measures using a Large National Dataset, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national benchmarks for national cardiac performance measures including the time from dispatch to first defibrillation in shockable rhythms, the proportion of these provided within 5 minutes, the proportion of patients over 35 with non-traumatic chest pain who received both aspirin and a 12 lead ECG, and the proportion of patients with acute decompensated heart failure (as defined by SBP > 200 and either a RR > 30 or an SpO2 < 90) who received both nitroglycerin and non-invasive pressure ventilation. Six and a half years of ESO data were analyzed. There were 11,144 cardiac arrests with an initial shockable rhythm, 14.6% were defibrillated within 5 minutes and the average time to first shock was 13.65 minutes. There were 533,127 patients over 35 with non-traumatic chest pain, 37.4% received both aspirin and a 12 lead ECG. There were 2,612 patients with acute decompensated heart failure and 80.4% received both nitroglycerin and non-invasive pressure ventilation. This was the first study to calculate national benchmarks for cardiac related EMS Compass measures.

58. Jarvis, J., Barton D., Sager L., Nudell N. Benchmarking the Use of Red Lights and Sirens in 9-1-1 Systems: A Review of a Large National Dataset, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national benchmarks for red lights and sirens utilization performance measures. Six and a half years of ESO data were analyzed. There were 7,709,012 9-1-1 calls that resulted in patient transport. 75.8% utilized red lights and sirens to the scene and 19.4% utilized red lights and sirens from the scene to the hospital. This was the first study to calculate national benchmarks for red lights and sirens use related EMS Compass measures.

59. Jarvis, J., Barton D., Sager L., Nudell N. EMS Compass Benchmarks using a National EMS Dataset: Status Epilepticus and Hypoglycemia Performance Measures, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national benchmarks for status epilepticus and hypoglycemia performance measures. Six and a half years of ESO data were analyzed. There were 147,238 patients with documented blood glucose <60, 79.7% received glucose. There were 11,148 patients with status epilepticus, 72.4% had a documented blood glucose and 56.1% had a benzodiazepine administered. This was the first study to calculate national benchmarks for status epilepticus and hypoglycemia related EMS Compass measures.

60. Jarvis, J., Barton D., Sager L., Nudell N. Benchmarking EMS Compass Trauma Scene Times and Traumatic Pain Management Performance Measures using a National Dataset, in National Association of EMS Physicians. 2018: San Diego, CA.

The study objective was to describe national benchmarks for trauma scene times and traumatic pain management performance measures. Six and a half years of ESO data were analyzed to calculate benchmarks for: (1) the percentage of patients with trauma alert criteria as defined by the CDC trauma triage criteria for transport to a trauma center who have a scene time under 10 minutes, and (2) of patients with any traumatic injury, the proportion with at least one pain scale documented. For those with an initial pain score >5, the proportion with a second score reassessing pain. Of patients from ALS agencies who had an initial score >5, the proportion with decreased pain from the first to last pain score. There were 66,414 critical trauma patients and 24.3% had a scene time less than 10 minutes. The average scene time was 16.4 minutes. There were 2,166,680 trauma patients, 48.6% had a documented pain score. Of the 503,656 patients with an initial pain score of >5, 20.6% experienced improvements in pain scores. This was the first study to calculate national benchmarks for trauma scene times and traumatic pain management related EMS Compass measures.

61. Jarvis, J., Wang, HE., Barton, D. Cumulative Success of Prehospital Advanced Airway Management in a National Cohort, in Prehospital Care Research Forum/EMS World & National Association of EMS Physicians. ESO Wave 2018. 2017/2018: Las Vegas & San Diego. Austin.
The study objective was to characterize cumulative Advanced Airway Management success rates in a national cohort of EMS agencies. Nine years of ESO data were analyzed. There were 61,793 patients that had Advanced Airway Management attempted included in the analysis. Results indicated that first pass prehospital Advanced Airway Management success rates improved from prior studies but were still low. Multiple attempts were common and often unsuccessful.