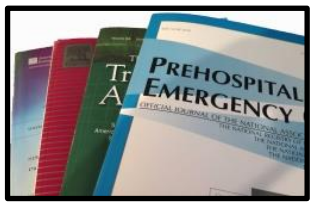
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up to Date with Current EMS Literature and Studies

Vol. 6.9

1. **Emergency Medical Services Management of Bronchospasm in the United States: A Cross-Sectional Analysis and Nationwide Quality Assessment**. Peters GA, Cash RE, Goldberg SA, Kolb LM, Ordoobadi AJ, Camargo Jr CA. *Prehosp Emerg Care,* 2024;28: 231-242.
2. **A comparison between intraosseous and intravenous access in patients with out-of-hospital cardiac arrest: A retrospective cohort study.** Lee AF, Chang YH, Chien LT,Yang SC, Chiang WC. *Am J Emerg Med* 2024;80:162-167.
3. **Characteristics and outcomes of prehospital and emergency department surgical airways**. Mathews AC, McLeod K, Lacy AJ, et al. *JACEPOpen* 2024 https://doi.org/10.1002/emp2.13136
4. **Does a prehospital applied pelvic binder improve patient survival?** Reiter A, Strahl A, Kothe S, et al. *Injury.* 2024;55:111392.

1. **Emergency Medical Services Management of Bronchospasm in the United States: A Cross-Sectional Analysis and Nationwide Quality Assessment**. Peters GA, Cash RE, Goldberg SA, Kolb LM, Ordoobadi AJ, Camargo Jr CA. *Prehosp Emerg Care,* 2024;28: 231-242.

Patients who present to EMS reporting shortness of breath are often experiencing bronchospasm. While managing bronchospasm is usually straightforward, for some patients, it can escalate into a life-threatening situation. In these critical cases, EMS must execute a well-structured clinical treatment plan to optimize patient outcomes. The authors of this cross-sectional analysis investigate current practices in managing patients presenting with acute bronchospasm in the prehospital setting.

The authors utilized the National EMS Information System Public Release Research dataset from 2018 to 2019 to analyze prehospital care for patients aged 2 years and older with suspected bronchospasm. The study assessed EMS care quality based on eight measures, analyzed agency-level variations in administering treatments, and compared intervention rates between pediatric and adult patients. The eight markers use by the authors were the SpO2, EtCO2, Full set of vital signs times 2, the administration of supplemental O2, inhaled beta 2 agonist, inhaled anticholinergics and systemic corticosteroids.

A total of 1,336,988 EMS encounters for suspected bronchospasm were included in the study. The median age of patients was 66 years, with only 4% being pediatric, and 55% were female. Advanced life support (ALS) units managed 94% of cases. Respiratory rate and pulse oximetry were documented in almost all cases (98% and 96% respectively). Supplemental oxygen was administered to hypoxic patients by 65% of basic life support (BLS) and 73% of ALS units. BLS administered inhaled beta-agonist therapy less frequently (48%) compared to ALS (77%). ALS administered inhaled anticholinergic therapy in 38% of cases and systemic corticosteroids in 19% of cases. Pediatric patients were less likely to receive supplemental oxygen when hypoxic and were also less likely to receive inhaled beta-agonists, inhaled anticholinergics, or systemic corticosteroids.

The authors note three limitations within the study. The first being the data set used was de-identified for agency and unit and community. This would allow the possibility of patient reports from the same patent being document by both BLS and ALS from separate agencies. Second the authors were unable to determine due to the de-identification if local, regional or state protocols were followed for an individual patent. Third the contribution of data to the database is voluntary and may not represent the nation as a whole.

This paper, like many before it, highlights deficiencies in the care provided to patients experiencing bronchospasm in the prehospital setting. However, it's crucial to examine the data and its relevance to the local EMS systems. For instance, the use of EtCO2 measurements in spontaneously breathing patients is common in ALS units but rare in BLS, where standalone EtCO2 devices are seldom used. Even if BLS providers could obtain these readings, the key challenge lies in implementing appropriate interventions based on them, which may exceed their scope and expertise. Additionally, the administration of beta-2 specific medications by BLS providers is only permitted by standing orders in 59% of states, and the method of administration (MDI vs. nebulizer) is unspecified. The administration of systemic corticosteroids by prehospital ALS providers varies based on local protocols and transport times, with longer transports potentially offering greater benefit.

There remains a noticeable gap in identifying and managing pediatric patients with bronchospasm at both BLS and ALS levels. Further research and education, incorporating agency and community data, would be valuable in addressing these gaps.

2. A comparison between intraosseous and intravenous access in patients with out-of-hospital cardiac arrest: A retrospective cohort study. Lee AF, Chang YH, Chien LT,Yang SC, Chiang WC. Am J Emerg Med 2024;80:162-167.

Establishing vascular access has been a fundamental intervention of resuscitating patients in cardiac arrest for a considerable time. Throughout the evolution of modern EMS, peripheral intravenous (IV) cannulation has been the preferred route. However, in recent years, the utilization of intraosseous (IO) access has emerged, initially serving as a backup to the IV route. The primary objective during out-of-hospital cardiac arrest (OHCA) is to promptly and efficiently secure access for drug and fluid administration, minimizing any potential complications.

The authors of this retrospective cohort study conducted in Taiwan focused on patients aged 18 years and older with non-traumatic OHCA who received on-scene resuscitation attempts by paramedics and had either intravenous (IV) or intraosseous (IO) insertion as their final vascular access from January 1, 2019, to December 31, 2022. Taiwan's EMS system shares similarities with the US system, where care is provided by paramedics from the fire department. The educational requirements for paramedics are also comparable, mandating a minimum of 1200 hours of initial education.

During the 4 year study period, 2,255 patients were included in the analysis, while 252 were excluded. Among the excluded, 166 experienced cardiac arrest enroute to the hospital, and 86 were resuscitated during the coronavirus pandemic. Of the 2,003 patients that remained for analysis, 1,602 received intravenous (IV) access, while 401 received intraosseous (IO) access as their final vascular access. Primary study outcome was the return of spontaneous circulation with a secondary outcome of discharge with favorable cerebral performance category (CPC) of 1-2.

A similar proportion of patients achieved sustained return of spontaneous circulation (ROSC) in both the intraosseous (IO) group (18.5%) and the intravenous (IV) group (20.7%), with no statistically significant difference observed between the two groups. Regarding the secondary outcome, a comparable percentage of patients were discharged with favorable cerebral performance category (CPC) scores (CPC 1-2) in the IO group (1.5%) and the IV group (2.5%), with no statistically significant

difference between them. However, in the subset of female patients, there was a positive ROSC response that favored the IV group.

The authors noted that besides the normal limitations of a retrospective study, provider bias and patient body mass index disparities could confound the results. In addition, no information was provided about the number of IV attempts made before an IO was inserted as rescue access.

Although this study did not identify any disparity in rates of ROSC or positive discharge between the IV and IO groups, it's important to acknowledge that, as per the protocols during the study period, intravenous (IV) access was typically the primary method for vascular access, with limited exceptions. The study did not explore whether outcomes would have differed had intraosseous (IO) access been attempted first. Conducting a prospective randomized study is necessary to inform future practices regarding preferred vascular access during cardiac arrest in the prehospital setting.

3. Characteristics and outcomes of prehospital and emergency department surgical airways.
Mathews AC, McLeod K, Lacy AJ, et al. *JACEPOpen* 2024 https://doi.org/10.1002/emp2.13136

Surgical airways, while rarely performed, are high acuity events with limited data on complications and long-term patient outcomes. Surgical airways can be performed either in the emergency department (ED) or in the prehospital setting. Currently 45 states include surgical airways in the paramedic scope of practice. Provider awareness of immediate complications and long-term sequelae of the procedure are imperative to guide how the procedure is taught.

This study is a single-center retrospective chart review of patients who underwent a surgical airway procedure either in the ED, prehospital setting, or at a referring ED prior to transfer. The timeframe of the study was 2008-2022. Patients were excluded if they were < 14 years of age. Prehospital outcomes of interest included confirmation tool for placement of the tube and bleeding requiring direct pressure. In-hospital outcomes of interest included morbidity and mortality, successful tube placement in the trachea, right mainstem intubation, airway complications, and hospital length of stay.

The authors identified 63 patients who received a surgical airway (34 prehospital, 11 ED, and 18 referring ED). The median number of endotracheal intubation (ETT) attempts prior to a surgical airway was 2. Six patients (12%) underwent a surgical airway without an attempt at ETT placement. Confirmation of placement was by end tidal carbon dioxide monitoring (ETCO2), either waveform or colorimetric, in half of patients (49.2%). The most common immediate complications were mainstem intubation (46%) and bleeding that required direct pressure (23.8%). Once in the hospital, 25 patients (39.6%) had an airway-related complication. Nine of these complications were deemed directly related to the technical aspects of the procedure and included aspiration, pharyngeal damage requiring repair, delayed bleeding, infection, and retained foreign body. Over half of the patients (n=34) survived to discharge, and of these over half (52.9%) had neurological disability long-term requiring assistance. The overall mortality rate was 46% (n=29), including seven who were pronounced upon arrival to the hospital with no further resuscitative efforts, four died in the ED prior to hospital admission, and 18 who died while admitted.

There were several limitations to this study. It is a retrospective study and no outcome comparisons could be made to those who did not receive a surgical airway. This was a single-center study, so their outcomes may not be transferable to other settings. The study was underpowered to conduct any useful statistical analysis predicting complications or outcomes.

This study was interesting in that it looked at outcomes after the rare surgical airway placement in prehospital and ED patients. As expected, mortality and neurological outcomes were not good as most patients receiving a surgical airway are already *in extremis* with a poor prognosis. The most common complications of right mainstem intubation and bleeding are not surprising. During the heat of the moment during a stressful emergency airway procedure it is not uncommon to advance an ETT too far

and into the right bronchus. This is especially true when doing a surgical airway below the level of the oropharynx, where the distance to the carina is shorter. This complication can be minimized by using a commercial cricothyroidotomy device similar to a tracheostomy. The other common complication of bleeding is also not uncommon. Skin-level and tissue bleeding is common with this procedure. Care must be taken to properly identify the cricothyroid membrane as incision lower on the neck can also injure an anterior thyroid vein which often is located near the midline. The take-home message of this study is that proper education of prehospital personnel, as well as physicians in the hospital, is critical to minimize the morbidity and mortality from an already rare and stressful life-saving procedure.

4. **Does a prehospital applied pelvic binder improve patient survival?** Reiter A, Strahl A, Kothe S, et al. *Injury.* 2024;55:111392.

Pelvic fractures remain a significant source of morbidity and mortality in blunt trauma patients. Pelvic binder application for patients with severe pelvic trauma has been suspected to diminish blood loss and theoretically provide stability to the pelvis. Proper application of the binder is crucial to achieve maximum benefit. The proper location of the binder is at the level of the greater trochanter. Improper placement of the binder can worsen some pelvic fractures, cause dislocation of certain fractures, and cause pressure sores and tissue necrosis. The aim of this study is to evaluate the effectiveness of prehospital pelvic binder placement as well as the rate of proper placement.

This was a retrospective study of patients transported to and treated at a Level 1 trauma center over a four-year period. Patients were included if they had an unstable pelvic fracture noted on arrival to the emergency department. A total of 66 patients were included in the study.

The authors used CT scanning to determine if the binders were properly applied. The ideal binder position was defined as being within 3 cm of the midpoint between the proximal and distal part of the greater trochanter on both sides. Based on this definition, the patients were divided into three sub-groups: (a) patients with a prehospital binder applied in the correct position (+/- 3 cm)(n=14), (b) patients with a prehospital binder applied outside of the correct position (< or > 3 cm)(n=14), and (c) patients who did not receive a prehospital pelvic binder (n=38).

The mean injury severity score (ISS) of the patient population was 22, with 60% of the patients having an ISS > 16, indicating moderate or severe injury. The prehospital application of a pelvic binder did not differ between those with an ISS above or below 16. Of the 66 patients in the study group 14 (21%) had the binder correctly positioned. Another 14 patients (21%) had the binder incorrectly applied. The remaining patients (58%) did not have a binder placed. There was no statistically significant difference in survival between those who did and did not receive a binder. Additionally, there was no survival difference between those who had a correct and incorrect placement. The authors noted ISS, heart rate, blood pressure, and hemoglobin level to be predictors of survival between the groups. ISS was the only predictor of mortality identified by the authors.

There are several weaknesses. The ISS is calculated by the trauma center after patient admission once all injuries are identified and classified. The ISS cannot be calculated by prehospital personnel and isn't even known by trauma team personnel at the time of patient arrival. The authors identified heart rate, blood pressure, hemoglobin, and ISS as differing between those who survived and did not survive. This is so intuitively obvious that it shouldn't even be mentioned. Finally, the sample size of only 66 patients is too small to draw any serious conclusions from the study. Pelvic binder application for severe blunt trauma remains controversial with data for and against potential benefit. This study should not change practice.