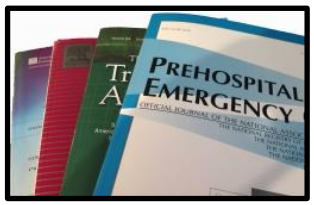
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up To Date with Current EMS Literature and Studies

Vol. 4.11

1. **Prehospital predictors for return of spontaneous circulation in traumatic cardiac arrest.** Benhamed A, Canon V, Mercier E, et al. *J Trauma Acute Care Surg.* 2022;92:533-560.
2. **Outcomes in patients not conveyed by emergency medical services (EMS): a one-year prospective study.** Höglund E, Schröder A, Andersson-Hagiwara M, Möller M, Ohlsson-Nevo E. *Scand J Trauma Resusc Emerg Med* 2022;30. Published and full-text available on-line at: https://sjtrem.biomedcentral.com/articles/10.1186/s13049-022-01023-3
3. **Prehospital Use of the Esophageal Tracheal Combitube Supraglottic Airway Device: A Retrospective Cohort Study.** Dufour-Neyron H, Tanguay K, Nadeau A, et al. *J Emerg Med* 2022;62:324–331.
4. **Out-of-Hospital Intubation Success Rates Vary Based on Transport Environment.** Shekhar AC, Blumen I. *J Emerg Med* 2022;62:171-174.

1. Prehospital predictors for return of spontaneous circulation in traumatic cardiac arrest.

Benhamed A, Canon V, Mercier E, et al. *J Trauma Acute Care Surg.* 2022;92:533-560.

Out-of-hospital traumatic cardiac arrest (TCA) has a historically low overall survival rate. Those who do survive often have a devastating neurological injury. France has a unique prehospital system, led by physicians on-scene. There is a greater emphasis on advanced life support (ALS) trauma care in France compared to North America, which emphasizes shorter scene times and rapid transport to a trauma center. The aim of this study is to assess factors associated with survival from prehospital TCA in a physician-led EMS system. The secondary objectives reviewed 30-day survival and neurologic function. The authors hypothesized that prehospital ALS interventions were associated with greater return of spontaneous circulation (ROSC).

The study is a retrospective review of prehospital TCA in France from 2011-2020. The French EMS system is a two-tiered system. Firefighters brigade (FB) provide the initial basic life support (BLS) response until the ALS mobile medical team (MMT) arrives on scene, led by a physician. TCA was defined as cardiac arrest caused by blunt, penetrating, or burn injury. Drowning, electrocution, and hanging/strangulation were not included. All TCA with MMT response who were transported to a hospital were included. The primary outcome was sustained ROSC (defined as a detected pulse > 1 minute). Secondary outcomes were 30-day survival, 30-day neurological status, and organ donation frequency among the deceased.

During the study period, 4922 TCA were reviewed. The median age was 46 years and 76% were male. TCA occurred most often in a public place (66%) and most were due to blunt trauma (81%). The median time from onset of until MMT arrival was 17 minutes. The median time from MMT arrival on-scene until arrival at the hospital was 85 minutes. Resuscitative endovascular balloon occlusion of the aorta (REBOA) and resuscitative thoracotomy are not performed.

ROSC on-scene was 21% (1037/4922). Blunt trauma, witnessed TCA, initial shockable rhythm, gasping, and pupillary activity were all predictors of achieving ROSC. Regarding ALS procedures, intravenous fluid resuscitation, blood product transfusion, and external hemorrhage control were more frequently performed in those achieving ROSC. Interestingly, finger and needle thoracostomy were not associated with increase rate of ROSC in this population. Negative predictive factors for ROSC included penetrating trauma, bag valve mask ventilation instead of intubation, and intraosseous catheter placement compared to peripheral IV placement. Survivors at 30 days were more likely to be younger, have a witnessed arrest, a shorter arrival time of the MMT, and have other signs of life such as gasping and pupillary response. Overall, 30-day survival was 1.4% (67/4922) and favorable neurologic status was reported as 72%.

This study has a number of limitations. This was a retrospective study and the choice of primary endpoint (ROSC) may not be as important as 30-day survival and neurologic outcome. In addition, penetrating and blunt trauma victims were analyzed jointly which may affect the results.

This is an interesting study from France supporting their practice of physician-led EMS with aggressive use of ALS interventions prior to transport. They report a higher rate of ROSC from this practice. This is in stark contrast to what is done in North America, where short scene times, rapid transport, and BLS over ALS is routine. While interesting, their results don't directly translate to North American practice. Additionally, the significantly higher percentage of penetrating trauma seen in North America may skew these results. The authors did not demonstrate improved survival in those TCA patients who receive prehospital thoracic decompression, either via needle or finger thoracostomy. This is difficult to explain in light of current data supporting otherwise. A subset analysis of TCA patients with thoracic injury may show different results. This is an interesting study but one that is unlikely to change practice, especially in North American prehospital care.

2. **Outcomes in patients not conveyed by emergency medical services (EMS): a one-year prospective study**. Höglund E, Schröder A, Andersson-Hagiwara M, Möller M, Ohlsson-Nevo E. *Scand J Trauma Resusc Emerg Med* 2022;30. Published and full-text available on-line at: https://sjtrem.biomedcentral.com/articles/10.1186/s13049-022-01023-3

Non-transport of patients by EMS is common worldwide. This practice has both positive and negative issues associated with it however there has been relatively little research documenting the end result of a no-transport decision. The authors of this paper sought to determine the effect of not transporting a patient on their outcome.

This was a prospective analytic study performed in Sweden with consecutive inclusion of all patients not transported by EMS for the 12-month period ending January 2017. The study regions included both rural and urban populations and involved three ambulance services with 30,000 calls a year. Ambulances are primarily staffed with a specialist ambulance nurses. On some occasions, the specialist nurse may be replaced by registered nurse or an Emergency Medical Technician. Regional guidelines describe the policy for no-transport which includes specific criteria outlining who can and cannot be considered for no-transport along with the use of a formal triage and treatment system. Outcomes were described as emergency department visits, admissions to hospital intensive care units and mortality within seven days of the interaction.

There were 30,599 EMS responses during the study period, of which 2,959 patients were not transported and 2,691 included in the study. Women accounted for 49% of the patients with a median age of 53 years while the male patients had a median age of 50 years. The age group with the highest number of non-transports was 65-80 y/o. Most of the non-transports occurred between 6pm and midnight on Saturdays, however the time of day or day of the week did not affect outcomes.

The most common patient complaint in the non-transports was non-specific or malaise in the adult population. Breathing difficulties and fever of unclear origin were the most common pediatric complaints. More than half of the non-transport patients were left with self-care instructions, while 30% of the adults went to primary health care on their own and 19% went on to the emergency department via another mode of transport.

In terms of outcome, 451 (16.8%) of the non-transported patients presented to the emergency room within 7 days, 137 (5.1%) were hospitalized and 18 (0.7%) died within 7 days after the non-transport event. Older patients were at higher risk of hospitalization and death within 7 days of not being transported by EMS. Of the 18 patients that died, 14 had a nurse or physician present when the non-transport decision was made and 6 had a documented palliative care or end of life decision and care plan. None of the non-transported patients in this study required admission to an intensive care unit.

There are several limitations to this study. The authors report a large amount of missing data, particularly regarding the lack of documentation of the triage and treatment score which is reportedly a critical part of the no-transport decision making. In addition, there was no way to determine which patients that went to the ED within 7 days were advised to do so versus those who had unplanned visits. Lastly, the EMS system differs from those in the US by staffing the ambulances with nurses rather than paramedics.

In this study, few patients compared to previous studies were admitted to the hospital or died after not being transported. Older age of the patients was the only variable that significantly contributed to subsequent ED visits, hospitalizations and deaths. While this study is reassuring that most patients who are not transported by EMS seem to do well, it is important to remember that the EMS system in Sweden uses a protocol with strict inclusion and exclusion criteria for no-transport decision-making.

3. **Prehospital Use of the Esophageal Tracheal Combitube Supraglottic Airway Device: A Retrospective Cohort Study.** Dufour-Neyron H, Tanguay K, Nadeau A, et al. *J Emerg Med* 2022;62:324–331.

The management of a patient's airway is often a critical component of successful management of a critically ill or injured patient. The optimal timing of intervention and device used are still controversial.

The authors of this retrospective prehospital cohort study examined the use of the Esophageal-Tracheal Combitube (CT) device in the province of Quebec, Canada. The Combitube is the only advanced airway device allowed for paramedic use in Quebec. The primary goal was to determine the success rate of placement and ventilation of the obtunded patient. Secondarily the authors hoped to determine the number of attempts needed to place the airway and ventilate the patient, the time spent on-scene, and the effect on patient mortality.

During the 12-month study period ending December 31, 2018, all patients who had a CT attempted or utilized were enrolled. Review of EMS records revealed 1194 patients where CT placement may have been an appropriate intervention. Of these, 580 (48%) patients actually had a CT placed or attempted. Most of the patients were male (63%) with a mean age of 67 years old. The presenting chief complaint leading to the use of CT was overwhelmingly cardiac arrest from all etiologies (99.3%).

A total of 515 patients had sufficient data to be enrolled in the study. Successful placement of the CT was documented in 427 (82.9%) patients. This was regardless of the number of attempts. There were sufficient data to determine the number of attempts in 349 of the 427 patients. Of this group 294 (84%) had a CT placed on the first attempt. In all 88 patients were unable to be ventilated using the CT device. There was no statistically significant difference in patient survival based on number of placement attempts.

Important limitations to the study include incomplete and missing data. During the study period the prehospital reports did not include a mandatory "number of attempts" box on the prehospital care report. This led to the need to examine the narrative text to see if the number of attempts was documented. It was theorized by the authors that those patients that required multiple attempts may not have had that documented in the free text of the patient encounter. In addition, successful placement was defined as visible chest rise, lung sounds on auscultation or positive end-tidal CO2 monitoring, however use of capnography was not a requirement.

There are a number of points to be made about this study. Care must be taken not to extrapolate these results into other EMS systems without careful review and comparisons. In this study the only available device for advance airway management was the CT and almost 1 in 5 patients could not be successfully ventilated. There are now a number of other supraglottic and laryngeal airways that have, in many cases, supplanted the CT. A robust study that examined patient outcomes with these various airway devices would provide more useful information and guidance.

4. **Out-of-Hospital Intubation Success Rates Vary Based on Transport Environment.** Shekhar AC, Blumen I. *J Emerg Med* 2022;62:171-174.

Oral endotracheal intubation is one of the critical skills taught to and practiced by Emergency Medical Services (EMS) providers to secure an airway in a critically ill patient. It remains part of the American Heart Association's Advanced Cardiac Life Support algorithms for management of cardiac arrest. Oral endotracheal intubation is a learned skill that must be practiced and performed frequently for providers to remain proficient. It is also an increasingly controversial pre-hospital provider skill. Done well, it can be life-saving. Done poorly, or when providers don't recognize a misplaced tube, the intervention can be detrimental to the patient.

The purpose of this study was to compare the success rate of air medical providers compared to ground EMS providers. The authors looked at 2019 data from the National Emergency Medical Services Information System (NEMSIS) database. They used NEMSIS to query oral endotracheal intubation attempts by three groups; ground transport EMS, rotor wing transport EMS and fixed wing transport EMS. All data were self-reported by the field providers. The authors primarily focused on mode of transport and if the oral endotracheal tube was reported as successfully placed. No consideration was given to the status of the patient prior to attempting intubation (cardiopulmonary arrest VS. with pulses), equipment used during the attempt (fiber optic, video, digital or conventional laryngoscope) or any patient optimizing medications.

Their query yielded 90,048 documented oral endotracheal intubations attempts. Ground ambulance providers attempted the vast majority of the intubations (95.38%). Rotor wing providers were second (4.35%) and fixed wing providers accounted for the least number of attempts (0.27%). Rotor wing providers had the greatest overall success rate (89.66%) followed closely by fixed wing providers (89.17%). Ground transport providers had the lowest success rate (75.69%).

The authors theorize that ground transport providers, while being the most prevalent and having the greatest number of attempts overall, likely have the least per provider exposure to critically ill patients. Aeromedical programs by design see and transport primarily critically ill patients and their providers likely spend more time training and practicing critical airway procedures.

Limitations to this study include the fact that all of the data was self-reported by the providers without verification or standardization. In addition, they could not account for the training or experience levels of the providers who reported the data or the number of attempts required to successfully intubate.

Oral tracheal intubation is a learned skill that can be both life-saving and potentially dangerous for patients. Providers need to be proficient in the procedure and cognizant of the risks involved. Agencies

should have measures in place to ensure that providers performing oral tracheal intubation are well trained, have opportunities for medical directed practice and review, and have adequate equipment and protocols in place to optimize success rates and to limit procedural risks.