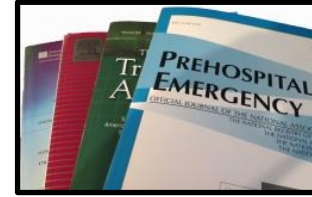


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IPHMI Literature Review

Keeping You Up To Date with Current EMS Literature and Studies

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- 1. The Use of Field Triage in Disaster and Mass Casualty Incidents: A Survey of Current Practices by EMS Personnel.** Ryan K, George D, Liu J, Mitchell P, Nelson K, Kue R. *Prehospital Emergency Care* 2018 Published on-line Feb 9, 2018
- 2. Effect of Bag-Mask Ventilation vs Endotracheal Intubation during cardiopulmonary resuscitation on Neurological Outcome After Out-of-Hospital Cardiorespiratory Arrest. A Randomized Clinical Trial.** Jabre P, Penaloza A, Pinero D, et al. *JAMA*. 2018;319(8):779-787
- 3. Value of prehospital assessment of spine fractures by paramedics.** ten Brinke J.G., Gebbink W.K., Pallada L, Saltzher TP, Hogervorst M, Goslings JC. *European Journal of Trauma and Emergency Surgery*, August 2017. Full text available at:
<https://link.springer.com/content/pdf/10.1007%2Fs00068-017-0828-0.pdf>
- 4. Accuracy of Prehospital Identification of Stroke in a Large Stroke Belt Municipality** Mould-Millman NK, Meese H, Alattas I, et al. *Prehospital Emergency Care*, 2018, Published on-line March 29, 2018. DOI: 10.1080/10903127.2018.1447620
- 5. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial.** CRASH-2 trial collaborators. *The Lancet*, 2010; 376:23-32. Full text available at:
[https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(10\)60835-5.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(10)60835-5.pdf)

- 1. The Use of Field Triage in Disaster and Mass Casualty Incidents: A Survey of Current Practices by EMS Personnel** Ryan K, George D, Liu J, Mitchell P, Nelson K, Kue R. *Prehospital Emergency Care* 2018 Published on-line Feb 9, 2018

The use of triage and triage tags to assign treatment and transport priorities by emergency medical service (EMS) personnel during a mass casualty incident varies greatly when comparing application during training, drills, and exercises versus utilization during actual events.

The purpose of this study was to compare current field triage practices during both training and actual MCIs and identify any barriers to use; using data collected through an anonymous survey provided to 596 EMS personnel from 3 distinct types of paid full-time EMS programs. The overall survey response was 77.9% (464/596). Out of the 464 responses, 179 respondents (38.7%) indicated they had participated in both drills utilizing triage tags and one or more actual MCIs. Triage tags were used in 91.8% of drills compared with 34.1% of actual MCIs. Common reasons cited for not utilizing a "full triage" (to include use of a specific triage algorithm and completion of a triage tag) during an actual MCI event included proximity to the nearest hospital, did not use / not sure how to use, logistics, and issues

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related to triage tags including inadequate access, inadequate amount, and poor tag functionality. While MCIs are not common in most EMS agencies the unusually large number of respondents indicating they had been involved in an actual MCI was because one of the EMS programs participating in the survey was involved with providing on-scene patient care during the Boston Marathon bombing in 2013.

Despite triage algorithms and triage tags being a fundamental skill taught in both primary and continuing EMS education and in MCI training exercises, full triage and triage tags have often not been utilized in actual events. Although an absent triage tag does not imply that a triage system/algorithm was not utilized on-scene, it can result in inefficient on-scene management as newly arriving EMS responders may triage patients already evaluated and triaged but not tagged.

This study supports what most EMS providers already suspected; regardless of the system implemented, prior education and training, service protocols, and MCI response drills, full triage processes are often not utilized on-scene during real world events. We must continue to evaluate the difference between what is expected of on-scene providers during a MCI event and what is actually being done and correlate the result with victim outcomes.

2. Effect of Bag-Mask Ventilation vs Endotracheal Intubation during cardiopulmonary resuscitation on Neurological Outcome After Out-of-Hospital Cardiorespiratory Arrest. A Randomized Clinical Trial. Jabre P, Penaloza A, Pinero D, et al. JAMA. 2018;319(8):779-787

For many decades the “Gold Standard” of airway management both in the prehospital and hospital phase of resuscitation has been early and aggressive endotracheal intubation (ETI). However, it is believed that bag mask ventilation (BVM) is a less complex modality for maintaining the airway and ventilation while performing Cardio-Pulmonary Resuscitation (CPR) during the Advanced Cardiopulmonary Life Support (ACLS) phase of resuscitation. Several recent retrospective registry-based studies have suggested that outcome from cardiac arrest is poorer when ETI is utilized while others suggest a benefit.

This prospective randomized study compares the 28 day outcomes of over 2000 out of hospital cardiac arrest patients in two groups that were randomized to airway management with BVM versus ETI. The primary outcome measure was survival to and neurologic status at 28 days post arrest. The study was conducted in France and Belgium over a 22-month period utilizing ALS ambulance units configured with an ambulance driver, a nurse and an emergency physician. There were 1020 patients in the BVM group and 1023 into the ETI group. All patients enrolled were 18+ years in age. The authors found a significantly greater ROSC rate in the ETI group 38.9% vs. 34.2% in the BVM group. However, there was no difference in survival to hospital admission (BVM vs ETI: 28.9% vs 32.6%) and survival to day 28 (BVM vs ETI: 5.4% vs 5.3%). Of note however, the BVM group had a significantly higher rate of gastric content regurgitation (15.2% vs 7.5%, $p < 0.001$). Thus the authors concluded that this study failed to demonstrate whether BVM or ETI was the preferred airway management technique in patients with OHCA.

There are a number of limitations to this the study when applying it to the general EMS service, particularly in the U.S. The first is the crew composition of the French and Belgium ALS response units. The ALS units include an Emergency Medicine Physician. Many of these physicians were initially trained as anesthesiologists. This study found a successful intubation rate of 91.8%. This is well above success rates in most other non-physician staffed EMS systems. The second limitation of this study was once ROSC was obtained in the BVM group, the patient was then intubated in the immediate post ROSC period. Thus, this study only evaluates the timing for ETI and not whether or not ETI should be performed. As the authors point out, additional study is needed since the optimal method of airway management for victims of OHCA has not yet been determined.

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- 3. Value of prehospital assessment of spine fractures by paramedics.** ten Brinke J.G., Gebbink W.K., Pallada L, Saltzher TP, Hogervorst M, Goslings JC. *European Journal of Trauma and Emergency Surgery* - August 2017 Full text available at:
<https://link.springer.com/content/pdf/10.1007%2Fs00068-017-0828-0.pdf>

Over the last several decades, protocols regarding spinal immobilization have evolved from being based primarily on mechanism of injury to the use of selective spinal immobilization protocols. The argument for this change was the lack of scientific evidence in support of spinal immobilization, the low numbers of immobilized patients that actually have spinal injuries, and the potential for injury or complications brought on by the devices used to immobilize patients. Interestingly, there is equally, little to no evidence to support the shift to exam based protocols either. This study sought to address that by evaluating the accuracy of prehospital evaluations for potential spinal fractures performed by Dutch paramedics.

This was a prospective cohort study that looked at all patients that presented with prehospital spinal immobilization to a single Level II Trauma Center between January 2013 and January 2014. Paramedics recorded their assessment of the probability of spinal fractures and their assessments were compared with diagnoses and patient outcomes at the hospital.

One hundred and ninety patients were immobilized in the field, of which 139 were included in the study. Paramedics predicted that 102 patients would likely have spine fractures. There were a total of 24 patients with spinal fractures and the paramedics identified 22. Both of the missed fractures occurred in fall from heights MOI. Of the 115 patients that did not have fractures, paramedics assessed 80 of them as likely having fractures. The authors concluded that paramedics have a low degree of accuracy predicting the presence of spinal fracture. Further, based on these results, they suggest that implementation of a protocol based on paramedic predictions will not reduce the overuse of spine immobilization.

The limitations of this study included the high number of exclusions based on incomplete data, they did not consider the experience of the paramedics in their data collection, and the fact that many patients with a high potential for spine injuries were taken to a level I trauma center and were thus excluded.

As the authors noted, this study is consistent with what other studies have shown. Health care providers in general cannot accurately predict spinal fracture. It appears that the change from protocols based on MOI to exam based protocols has not resulted in better identification of patients who do or do not require spinal immobilization. We have yet to find the right answer to make sure we do what patients need, no more, no less.

- 4. Accuracy of Prehospital Identification of Stroke in a Large Stroke Belt Municipality.** Mould-Millman NK, Meese H, Alattas I, et al. *Prehospital Emergency Care*, 2018, DOI: 10.1080/10903127.2018.1447620

Strokes are the fifth leading cause of mortality in the United States, and the leading cause of long-term disability. There is a thirteen state "Stroke Belt" across the southeastern United States. While the overall incidence of strokes has decreased in the last twenty years, the incidence of stroke has instead increased in the African American population residing in the Stroke Belt. The sooner a stroke is recognized and access to specialized, definitive care is obtained; the greater the likelihood of minimizing disability. The study assessed whether Emergency Medical Dispatchers (EMD) and Prehospital Providers

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working in a large municipality, within the Stroke Belt, accurately identify patients suffering from an acute stroke and transport them to a Stroke Center.

The study examined all medically related 911 patients classified as “Stroke” transported by Grady EMS (Fulton County, Atlanta, Georgia) between 1 January 2012 and 31 December 2012. The study was a retrospective, observational cohort based study granted a waiver of consent by the Emory University Institutional Review Board and the Colorado Multiple Institution Review Board. A database was created to link records between Grady EMS, Grady Hospital Emergency Department and the Grady Hospital Stroke Registry. Exclusion criteria included patients less than 18 years of age, that had previous or concurrent head injury, transferred from another inpatient facility and/or had incomplete records in any of the three databases.

EMD identification of stroke symptoms was done via standardized, scripted questioning of callers, which triggered a simultaneous series of prehospital activities (EMD assisted pre-arrival instructions and a rapidly dispatched Advanced Life Support [ALS] Ambulance to the scene). Evaluating paramedics would then confirm or refute the stroke symptoms guided by a prehospital stroke protocol. The protocol included the last known well time, the Cincinnati Prehospital Stroke Scale (CPSS), vital signs, blood glucose level, and rapid transport to a stroke center.

A total of 548 patients were included in the study. Paramedics adhered to all elements of the stroke protocol in 76.4% of patient contacts. 475 of those patients were transported with an EMS impression of Stroke and 73 with an impression other than Stroke. Sensitivity and Positive Predictor Value for stroke identification were 76.2% and 49.3% respectively. For EMD it was 48.9% and 24% respectively.

The study concluded that EMD and EMS personnel in a large Stroke Belt city had a relatively high sensitivity in identifying acute stroke patients. Paramedic accuracy was augmented by EMD recognition as well as positive CPSS screening. Of note, paramedics were less likely to accurately identify stroke in women when compared to men or when the etiology was hemorrhagic in origin.

Early identification of stroke patients by EMD and relaying that information to responding prehospital providers may hasten assessment for stroke by EMS personnel on scene and direct patient flow to stroke centers, saving time and brain. With available screening tools EMD and prehospital providers should be able to identify patients suffering from acute stroke, especially in an area with a population predisposed to stroke.

5. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial.

CRASH-2 trial collaborators. *The Lancet*, 2010; 376:23-32 Full text available at:

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Severe traumatic hemorrhage drastically alters the ability of the body to form clot. In a normal condition, our body is simultaneously creating clot when necessary but also breaking down that clot to prevent occlusion of blood vessels. This mechanism is disrupted in the severely bleeding patient. Tranexamic acid (TXA) is an inexpensive and safe medication which has been used for decades in cardiothoracic, orthopedic, and gynecologic surgery. TXA works by preventing the body from naturally breaking down clot as it forms. By doing this, TXA helps control bleeding. In the last decade TXA has gained momentum for use in the severely bleeding trauma patient.

The CRASH-2 trial was published in the *Lancet* in 2010 and was the first large trial evaluating TXA use in the severely injured patient. It was a blinded, partially randomized trial involving 274 hospitals in 40 countries (the United States was not involved due to informed consent rules). During this study

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20,211 adult trauma patients were enrolled and received either TXA (10,060 patients) or placebo (10,067 patients). Patients were enrolled if they had major hemorrhage (systolic blood pressure < 90 mm Hg or heart rate > 110 beats per minute) or were suspected to have major hemorrhage based on clinical suspicion of the provider. The trial is considered partially randomized because the treating physician could decide to administer or withhold TXA based on their clinical suspicion of bleeding. The patients were only randomized if the physician did not have a strong opinion that they patient may or may not need TXA. The outcome being measured was death within 4 weeks of injury. The authors found that those who received TXA had improved survival over those who received placebo (mortality 14.5% vs 16%). Death specifically due to bleeding was reduced in those who received TXA (4.9% vs 5.7%). The authors also noted a survival advantage in those who received TXA within 3 hours of injury, with the most significant benefit seen in those given TXA within 1 hour of injury. For reasons that remain unknown, those who received TXA more than 3 hours after injury had a worse outcome.

The CRASH-2 trial has several criticisms which should be noted. The study was not a true randomized study, as the provider could decide the course of treatment if they wished. This weakens the validity of any large study. While there were a large number of patients enrolled, less than 50% had unstable vital signs (hypotension or tachycardia) or even required a blood transfusion. One could argue the survival data is not accurate since so many patients received TXA who likely did not need it. Of those who died, only 35 % actually died from bleeding (traumatic brain injury was the most common cause of death). This again questions the patient selection and whether the survival benefit is accurate. Finally, critics note that the authors required 20,000 patients to prove a 0.8% survival benefit. The number needed to treat, which is defined as the number of patients who need to receive the drug in order to show benefit in one patient, is very high at 67.

The CRASH-2 trial is a very important trial for the prehospital provider to understand. The results of this trial altered trauma resuscitation worldwide by encouraging physicians to provide a safe, inexpensive medication which may slow clot breakdown in the hemorrhaging patient. TXA administration is especially relevant in the prehospital setting because it derives the greatest benefit from early administration (within 3 hours of injury). Careful analysis of the trial methods and results do show areas of concern and provide a good lesson for those wanting to learn more about how to critically analyze medical literature. This is a large, multicenter, international, randomized trial evaluating the effect of a relative safe and inexpensive drug. On the surface the data appear to be clearly in support of the use of TXA. The weaknesses in the study cannot be ignored and needing to treat 67 patients to potentially show a small survival benefit in one patient may ultimately doom the use of TXA in the trauma population.