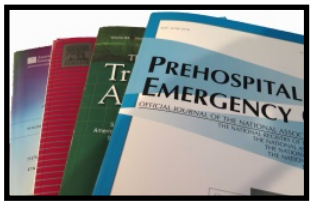
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up To Date with Current EMS Literature and Studies

V.1.2

1. **The trauma center is too late: Major limb trauma without a pre-hospital tourniquet has increased death from hemorrhagic shock.** Scerbo MH, Holcomb JB, Taub E, et al. J Trauma Acute Care Surg. 2017;83: 1165-1172.
2. **Under triage in trauma: Does an organized trauma network capture the major trauma victim? A statewide analysis** Michael A. Horst, PhD, Shreya Jammula, Brian W. Gross, et al. J Trauma Acute Care Surg. 2018;84:497-504.
3. **Association of Prehospital Mode of Transport with Mortality in Penetrating Trauma, A Trauma System-Level Assessment of Private Vehicle Transportation vs Ground Emergency Medical Services.** Wandling M, Nathens A, Shapiro M, Haut E. JAMA Surg. 2018;153(2):107-113.
4. **Basic and Advanced EMS Providers Are Equally Effective in Naloxone Administration for Opioid Overdose in Northern New England**. Gulec N, Lahey J, Suozzi JC, et al. Prehosp Emerg Care. 2018;22:2, 163-169.

1. The trauma center is too late: Major limb trauma without a pre-hospital tourniquet has increased death from hemorrhagic shock. Scerbo MH, Holcomb JB, Taub E, et al. *J Trauma Acute Care Surg.* 2017;83: 1165-1172.

The U.S. military revitalized the utilization of tourniquets for major extremity trauma following analysis of their data from the Iraq and Afghanistan wars. They note that survival in patients with exsanguinating extremity trauma is significantly improved with early (prehospital) use of tourniquets, with the greatest survival advantage noted in those who have a tourniquet placed prior to the onset of shock. Severe complications from tourniquet use, a long held dogma in trauma care, proved not to be true. They demonstrated tourniquets to be safe, effective, and life-saving. The question facing trauma providers is does this survival advantage translate to the civilian world? Military trauma is different than that encountered by the civilian medic. Transport times are longer, care under fire is more common (making it difficult to apply direct pressure), and the mechanism of injury is different (blast and penetrating trauma in the military versus primarily blunt trauma in the civilian population).

In this article, Scerbo and colleagues review their data from a busy, urban, Level 1 trauma center. They hypothesized that late tourniquet use, defined as tourniquet application after arrival to the trauma center, would have a higher death rate from hemorrhagic shock than tourniquet application in the prehospital setting. They reviewed their data over an 8-year period and classified tourniquet application as prehospital (T-PH) or trauma center (T-TC). Each case was classified as indicated (vascular injury requiring repair/ligation, operation on the extremity within 2 hours of arrival, or traumatic amputation), relative indication (major musculoskeletal/soft tissue injury requiring operation within 2-8

hours of arrival or documented large blood loss on-scene), or non-indicated. Measured outcomes were death from hemorrhagic shock, physiology upon arrival to the trauma center, and massive transfusion requirements.

Three hundred six patients received 326 tourniquets – 157 upper and 147 lower extremities. Median age was 34 and most patients had isolated major limb trauma. Blunt mechanism was most common (70%), primarily from motor vehicle collisions (63%). Two hundred fifty-two (89%) of the prehospital tourniquets were indicated. Patients who had an indication for tourniquet placement had a 4.5-fold increased risk of death if the tourniquet was delayed until trauma center arrival. Delay in tourniquet application was also associated with a longer ICU length of stay and higher plasma transfusion requirement.

This is the first large study to demonstrate the benefit of tourniquet application for severe extremity trauma in the civilian prehospital setting. Survival was 4.5 times higher for those who needed a tourniquet and received it in the prehospital setting. Delay in tourniquet application resulted in a higher mortality rate from hemorrhagic shock. If your service is one of the few remaining holdouts which does not have tourniquets available then this study should be carefully reviewed and should change your practice.

2. **Under triage in trauma: Does an organized trauma network capture the major trauma victim? A statewide analysis.** Michael A. Horst, PhD, Shreya Jammula, Brian W. Gross, et al. *J Trauma Acute Care Surg.* March 2018;84:497-504.

For as long as triage has been used to determine where and when trauma patients should be transported, the issue of over and under triage has been a concern. There have been arguments made on whether it was better to have an acceptable level of under-triage or over-triage. The discussion is important because there are clearly risk/benefit repercussions. Critical trauma patients may not get the care they need if under-triaged and other patients, if over-triaged, may unnecessarily use resources better reserved for other patients.

This study was a statewide analysis of trauma patients in Pennsylvania from 2003 to 2015 using two databases: one that contains all patient admissions in the state and the second that records all patients admitted to trauma centers. It is a mature trauma system that has in place for over three decades. Patients were grouped according to ISS: those with ISS >9 and then those with ISS >15.

The trauma hospital database reported that 38 trauma centers had 173,022 patients admitted with an ISS>9 and 99,449 with an ISS >15 while the statewide database reported 185 hospitals admitted 255,263 patients with ISS>9 and 149,772 with an ISS>15.

The authors were “astonished” to find that, in such a mature system, 30% of patients with moderate (ISS>9) and severe (ISS>15) trauma were transported to non-trauma centers. This finding is consistent with previous research that has shown a national pattern of 1/3 of moderately or severely injured trauma patients not being transported to a trauma center.

Limitations in this study included the trauma criteria used by the two databases which may have excluded cases which should have been included. Personal identifiers were removed making it impossible to link to the two patient data sets to determine if patients that were initially transported to a non-trauma center were subsequently transferred to a trauma center. Another limitation to this study was the use of ISS calculated at discharge as a triage criterion for admission to a trauma center. Lastly, the authors were unable to draw any conclusions about undertriage and mortality because of limitations in the available information from the state-wide database.

This study appears to agree with most that, even with appropriate state-wide trauma protocols in place, significant under triage is still taking place. If the ultimate goal is to achieve “zero preventable

deaths", then significant improvement in trauma triage must occur and moderately to severely injured patients must be transported to a trauma center.

3. **Association of Prehospital Mode of Transport with Mortality in Penetrating Trauma, A Trauma System-Level Assessment of Private Vehicle Transportation vs Ground Emergency Medical Services.** Wandling M, Nathens A, Shapiro M, Haut E. JAMA Surg. 2018;153(2):107-113.

Time to definitive care is seen as important in the outcome of patients with penetrating trauma. Trauma center emergency departments operating in an urban environment often see "drop offs" of patients suffering from gunshot or stab wounds who were transported by private vehicles. In addition, in some cities, police transport of these types of trauma victims is commonplace rather than ambulance transport. Patients taken to a hospital by automobile generally have little to no medical care provided either before or during transport, unlike those victims transported by ambulance. This study looked to compare the outcome of patients transported by ground EMS services versus by private vehicle to level 1 and 2 trauma centers in the 100 most populated metropolitan areas of the United States

This retrospective cohort study compared 103,029 patients who were 16 years of age or greater and had a gunshot (GSW) or stab wound. Data was taken from the National Trauma Data Bank from Jan. 1, 2010 and Dec. 31, 2012 or level 1 and 2 trauma centers in these Metro areas. The study group was predominantly male (87.6%) with a mean age of 32.3 years of age. Traditional ground EMS transported 86,097 (83.6%) versus 16,932 (16.4%) transported by private vehicle. Mean Injury Severity Score (ISS) was significantly lower in the private vehicle vs EMS transport mode (5.5) vs (10.1). The unadjusted mortality for both gunshot wounds and stab wounds was lower for patients taken by private vehicle (GSW-4.5%, SW-0.2%) compared to ambulance transport (GSW-19.3%, SW-2.9%). After risk adjustment, individuals with penetrating trauma transported by private vehicle were less likely to die than those transported by traditional ground EMS (odds ratio 0.38; 95% Cl, 0.31-0.47).

This study clearly suggests that, in metropolitan areas, penetrating trauma victims transported by private vehicles to Level 1 and 2 Trauma Centers have a greater likelihood of survival. There were, however, some limitations to this study. This study did not include all penetrating trauma patients that were transported to hospitals in the urban areas studied, only those transported to a level 1 or 2 trauma center that report their data to the NTDB. It is assumed that there would be a trauma triage system in place requiring those patients transported by EMS to be taken to level 1 or 2 Trauma Centers; the same is likely not true with those transported by private vehicle. These patients are often transported to the closest hospital, not necessarily a Trauma Center. As such, these patients were not captured in the study. Another limitation to this study was the lack of prehospital time data for both transport methods. The study also raised the question if the increase in mortality in the EMS group was related to the presumed increased in time to definitive care (response time + time on scene) or if some facet of care rendered by EMS providers contributes to this outcome. In either case further studies are warranted before private vehicle transport of penetrating trauma victims can be widely advocated. Lastly, it is important to remember that this study does not apply to victims of blunt trauma.

4. **Basic and Advanced EMS Providers Are Equally Effective in Naloxone Administration for Opioid Overdose in Northern New England**. Gulec N, Lahey J, Suozzi JC, et al. Prehosp Emerg Care. 2018;22:2, 163-169.

Opioid overdose deaths have been described as an epidemic in the United States, and are now the leading cause of accidental death. Naloxone is a medication often given in the prehospital phase of care to reverse the effects, particularly respiratory depression, of opioid overdose. *The National EMS*

Scope of Practice Model recommends that only Advanced Life Support (ALS) level be allowed to administer Naloxone. This recommendation has important implications for rural areas which typically have fewer available ALS providers. This study evaluated the effectiveness of naloxone administration by basic life support (BLS) providers as compared to ALS providers.

The authors of this study conducted a 33-month, retrospective study of all patients who received Naloxone in the three rural states of Vermont, New Hampshire and Maine. These three Northern New England states use the same electronic prehospital medical record system with consistent data entry fields, and all allow both ALS and BLS providers to administer naloxone (BLS via the intranasal route only). They assessed response to naloxone using three patient outcome measures: (1) Change in initial respiratory rate (RR) from less than 12 breaths per minute (BPM) to greater than or equal to 12 BPM; (2) Improvement of Glasgow Coma Scale (GCS) from initial to final value; and (3) Response to medication as per the global assessment (GA) documented by the EMS provider as "improved" or "not improved" after Naloxone administration.

The study group reviewed and included 231 BLS, and 2,833 ALS Naloxone administrations. Naloxone administration was considered appropriate in cases where the RR is less than 12 and the GCS is <15. Forty-two percent of cases treated by BLS providers and 43% of cases treated by ALS providers met this criterion with no difference between the provider groups. Both BLS and ALS cases saw a 64% improvement in GCS following naloxone. The BLS group saw a 43% increase in RR while the ALS group documented a slightly higher 48% improvement. The BLS providers documented an 80% improvement in GA while the ALS group rate of GA improvement was 67%.

The study shows that Rural BLS providers were as effective as ALS providers in improving the outcome measures of RR, GCS and GA following naloxone administration to patients with suspected opioid overdose. *The National EMS Scope of Practice Model* should be reviewed and updated to include naloxone administration via the intranasal route as a BLS skill. Expanding the administration of naloxone to BLS providers is further warranted by the fact that many communities offer naloxone to lay relatives to administer in the event of opioid overdose. Not allowing medically trained BLS providers to also administer the medication no longer makes sense.