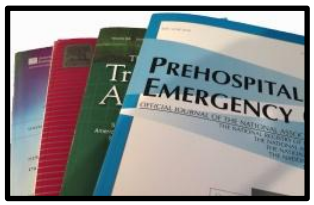
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up to Date with Current EMS Literature and Studies

Vol. 8.9

1. **Prehospital Resuscitation with Type O Whole Blood for Trauma and Hemorrhage.** Sperry JL, Guyete FX, Cotton BA, et al. *New England Journal of Medicine*, 2026;394:2317-2328.
2. **Naloxone administration associated with improved survival in PEA out-of-hospital cardiac arrests.** Niederberger SM, Wang RC, Rodriguez RM, et al. *Resuscitation* 2026, 111139
3. **EMS protocol gaps for defibrillator pad placement in prehospital STEMI care.** Packel C, Costa S, Flamm A. *Amer J Emerg Med* 2026;106:30-32.
4. **Association between prehospital time and trauma outcomes: A multicenter cohort study from the Pan-Asian Trauma Outcomes Study (PATOS).** Usawasuraiin P, Angkurawaranon C, Tangsuwanaruk, et al. *American Journal of Emergency Medicine* 2026;106:115–123

1. **Prehospital Resuscitation with Type O Whole Blood for Trauma and Hemorrhage.** Sperry JL, Guyete FX, Cotton BA, et al. *New England Journal of Medicine*, 2026;394:2317-2328

Prehospital blood transfusion for the treatment of traumatic hemorrhage shock is associated with improved survival compared to delayed transfusion or no transfusion. Early prehospital blood transfusion practices centered around component therapy – transfusion of individual blood components (packed red blood cells and fresh frozen plasma). In the hospital, component therapy can also involve platelet transfusion, although this practice is not utilized in most prehospital settings. Recently, transfusion of low-titer group O whole blood (which as low anti-A and anti-B antibody titers) has become more common in both the military and civilian settings.

Whole blood provides rapid, balanced volume resuscitation as well as reversal of coagulopathy. Concerns have been raised regarding the shelf-life of whole blood, which is limited to 21 days. Early observational studies have shown whole blood transfusion to be safe and to have better outcomes than transfusion with component products. However, no large studies have been done to see if prehospital whole blood transfusion truly improves outcomes. The Type O Whole Blood and Assessment of Age during Prehospital Resuscitation (TOWAR) study was designed to evaluate the safety and efficacy of prehospital transfusion with low-titer group O whole blood as compared to blood components. The authors hypothesized that prehospital transfusion with whole blood would lead to improved 30-day mortality compared to transfusion with blood components.

This is a multicenter randomized trial comparing outcomes between prehospital patients who received up to 2 units of low-titer group O whole blood (the “whole blood” group) versus those who received red blood cells, plasma, or both (the “component” group). Other than the blood administration, the other aspects of care remained the same and were not altered. Eligible patients were trauma patients transported by aeromedical crews either directly from the scene or transferred from an emergency department to one of the participating trauma center study sites. The patients had to have had at least one episode of hypotension (defined as a systolic blood pressure ≤90 mm Hg) and tachycardia (heart rate ≥ 108 beats per minute) or severe hypotension (SBP ≤ 70 mm Hg) without

tachycardia. The primary outcome measure was death from any cause within 30 days of injury. Secondary outcomes included death within 3, 6, and 24 hours after arrival to the trauma center; death in the hospital; death attributable to hemorrhage or brain injury; the amount of blood products transfused during the first 24 hours after arrival; multiple organ failure; nosocomial infection; acute respiratory distress syndrome; allergic or transfusion reactions; time to hemostasis; and coagulation measurements. Since the shelf life of whole blood is a concern, the study group also assessed survival based on how long the blood had been in storage. They divided the length of storage time between donation and transfusion into 1-14 days versus 15-21 days.

The study group included 1020 patients, of which 715 were assigned to the whole-blood group and 305 to the component group. Most of the patients were men (73.5%) and had a blunt mechanism of injury. The median Injury Severity Score was 25 (indicating a severely injured cohort of study patients). In the whole blood group, 343 (48%) received 1 unit of whole blood, 326 (45.6%) received 2 units, and 46 (4.6%) received no whole blood. Within the component group, 136 (44.6%) received 1 unit of red cells, 129 (42.3%) received 2 units of red cells, 117 (38.4%) received 1 unit of plasma, and 93 (30.5%) received 2 units of plasma; 175 patients (57.4%) received both red cells and plasma. Mortality at 30 days was 25.9% in the whole blood group and 20.5% in the component group. There were no differences in any of the secondary analyses. The survival based on the shelf-life age of the whole blood showed no difference between blood which had been stored for 1-14 days compared to blood stored for 15-21 days.

There were limitations to the study. The medics could not be blinded to the products they were transfusing, which could theoretically lead to treatment bias. The overall volume of blood transfused in the prehospital setting was low compared to the volume transfused in the hospital. The component group included several different treatment options (red cells, plasma, or both) yet was lumped together for data analysis. There was a small amount of crossover between groups (some randomized to whole blood received component therapy and vice versa).

This study demonstrates that in patients at risk of hemorrhagic shock who underwent prehospital blood transfusion, whole blood transfusion did not result in a lower 30-day mortality compared to those who received component therapy. The storage time for the whole blood (up to 21 days) also did not affect mortality.

It should be noted that prehospital transfusions do improve mortality and are becoming an essential aspect of prehospital trauma care. This study merely demonstrates that whole blood did not improve mortality compared to component therapy. It should not be interpreted to mean that prehospital blood transfusion is not beneficial.

2. Naloxone administration associated with improved survival in PEA out-of-hospital cardiac arrests.
Niederberger SM, Wang RC, Rodriguez RM, et al. *Resuscitation* 2026, 111139

Out-of-hospital cardiac arrest (OHCA) has traditionally been an issue primarily encountered by prehospital care providers. In the past, the majority of OHCA cases were primarily linked to myocardial infarction. However, in recent years, there has been a significant increase in cases of OHCA resulting from opioid overdoses. Opioid-associated out-of-hospital cardiac arrest (OA-OHCA) has now become a common occurrence in many urban areas. This retrospective cohort study explores the administration of naloxone in patients suspected of experiencing OA-OHCA.

The authors conducted a retrospective study of out-of-hospital cardiac arrest (OHCA) patients aged 18 or older treated by ALS EMS units, using data from the ESO Data Collaborative for 2019 and 2020, representing approximately 25% of the United States' EMS agencies.

Inclusion criteria were patients with OHCA where resuscitation was attempted by Advanced Life Support (ALS) units with linked hospital outcome data. Excluded cases included those with Do-Not-

Resuscitate orders, treatment refusal, patients under 18 years old, pregnant patients, encounters in healthcare settings, interfacility transports, or those with responses from Basic Life Support (BLS) units only. Cases with EMS response time greater than 60 min, resuscitation attempts greater than 60 min in duration, and with prolonged interval from collapse to initiation of CPR greater than 60 min due to the low likelihood of survival beyond this threshold.

After applying the study parameters, the authors analyzed 40,333 cases, of which 7,567 patients received naloxone (18.8% of the total). Before matching, the rate of achieving return of spontaneous circulation (ROSC) before hospital arrival was 21.5%, and the survival rate to hospital discharge was 9.0%. After matching for similar characteristics, patients with pulseless electrical activity (PEA) who received naloxone had similar ROSC rates (22.7%, OR 1.09) but a higher survival rate (11.1%, OR 1.46). There were no differences in outcomes among patients with shockable rhythms or asystole with naloxone administration.

The authors noted the study's major limitation to be its retrospective design. EMS provider bias could not be ruled out, as.

The use of naloxone in this study of OA-OHCA is associated with increased survival to discharge following the event for patients who present in PEA. Other shockable rhythms or asystole did not demonstrate increased survival. The mechanism remains unclear and requires further investigation, along with the timing and dose of administration. While guidelines for determining who may benefit from naloxone in the face of cardiac arrest have been suggested, they are not widely applied. Further prospective randomized studies need to be conducted.

3. EMS protocol gaps for defibrillator pad placement in prehospital STEMI care. Packel C, Costa S, Flamm A. *Amer J Emerg Med* 2026;106:30-32.

In the United States, it is estimated that 363,000 ST-segment elevated myocardial infarctions (STEMIs) will be transported to the hospital by EMS each year. Of those patients, previous studies estimate that roughly 10%, or 36,000, will suffer from cardiac arrest before reaching the hospital. Ventricular fibrillation and ventricular tachycardia are two of the most common presenting cardiac arrest rhythms. It is estimated that the chances of successful defibrillation diminish by 7%-10% for each minute the patient remains in cardiac arrest prior to defibrillation.

Placing defibrillation pads on a STEMI patient prior to cardiac arrest can reduce the time to first shock by 55 seconds. The authors of this study looked at published EMS treatment protocols across the United States to determine how many states require or recommend defibrillator pad placement on STEMI patients transported by EMS. They additionally looked at guidelines for initial 12 lead ECG acquisition and interpretation for EMS patients with chief complaints indicative of a possible cardiac event.

The authors conducted a Wellspan Institutional Review Board approved, review of published state-wide EMS protocols for STEMI across the United States. Three independent researchers reviewed each protocol. Consensus was achieved for each protocol reviewed and each was categorized as either; apply defibrillator pads, consider applying defibrillator pads or no guidance on defibrillator pads. Thirty EMS protocols were reviewed. Only 4 (13%) protocols instructed EMS crews to apply defibrillator pads. Five (17%) instructed EMS to consider applying defibrillator pads and the remaining 21 (70%) offered no guidance on defibrillator pads.

Further review of the protocols revealed that 33% stated a specific time goal from patient contact to acquisition of an ECG. A 10-minute patient contact to ECG acquisition was found in 30% of the reviewed protocols and an additional 3% of the protocols stated a 5-minute goal for first ECG. The American Heart Association (AHA) recommends that an ECG be obtained and interpreted within 10-minutes of first medical contact.

The authors acknowledged that some of the protocols reviewed were greater than three years old and may not be representative of current practice. It was also noted that some EMS agencies and regions may have their own protocols and policies time goals for defibrillation pad placement or ECG acquisition on all STEMI transports that were not available to the authors.

EMS protocols should be representative of best practice and patient care. They should align with subject matter experts such as the AHA in stating targeted treatment goals and timelines. Preemptively applying defibrillator pads onto patients at high risk for ventricular fibrillation / ventricular tachycardia, such as STEMI patients, is a relatively inexpensive option to reduce time to first shock by close to 1-minute if the patient arrests and should be considered as an addition to STEMI protocols as they undergo revision and review.

4. **Association between prehospital time and trauma outcomes: A multicenter cohort study from the Pan-Asian Trauma Outcomes Study (PATOS).** Usawasuraiin P, Angkurawaranon C, Tangsuwanaruk, et al. *American Journal of Emergency Medicine* 2026;106:115–123

Prehospital time is a critical determinant of trauma outcomes although optimal duration remains unclear. They sought to examine how components of prehospital time influence trauma patient outcomes.

This is a multi-center retrospective cohort study of trauma patients who received EMS care across multiple Asian countries. They looked at ground transported patients between January 2019 and December 2022 using the Pan-Asia Trauma Outcomes Study database (PATOS). The time intervals studied include response time (RT), on scene time (OST), transport time (TPT) and total prehospital time (TPT). The outcomes were In-hospital mortality and poor functional outcome defined as a Glasgow Outcome Scale score ≤4.

A total of 8,968 patients from Taiwan, Malaysia, Korea and Thailand were included, of which 376 (4.2%) died in-hospital and 8,592 survived to hospital discharge. Most were from Taiwan (65.7%), Malaysia (22.11%), Korea (9.62%), and Thailand (2.56%). Traffic injuries were the most common mechanism (63.9%) followed by slips and falls at (8,7%) and blunt injuries at 2.85%). The dispatched EMS units were BLS in 12.3% of the cases. The mean prehospital times were RT of 16.2 min., OST of 9.6 min., TT of 9.9 min. and TPT of 35.7 min.

Longer RT and OST were independently associated with increased in-hospital mortality. Prolonged OST and TT were associated with poor functional outcomes. In patients with traffic related injuries, longer RT and OST were significantly associated with mortality.

The authors listed several limitations to this study. The fact that it is a retrospective study prevents identifying causes of the outcomes linked to prehospital time. The fact that it is a multinational study and the differences in how the EMS systems are managed produces gaps in data collection and the applicability of their results to those systems. Their results were also limited by the exclusion of patients due to missing data affecting the representativeness of their final cohort. They also listed the varying accuracy of the reported times and unmeasured variables such as scene complexity or EMS decision-making as limitations to their study.

While this study confirms previous work regarding prehospital time and trauma patient outcomes, prolonged RT and OST were associated with increased mortality and extended OST and TT times were associated with poor functional outcomes. These associations may reflect more severely injured patients requiring additional care. Identifying the most influential components of prehospital time could guide targeted strategies to optimize EMS systems and improve trauma outcomes.