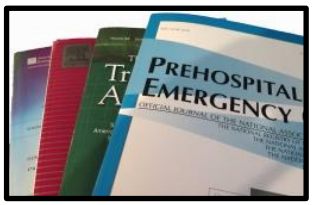
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up To Date with Current EMS Literature and Studies

V. 1.5

1. **Accuracy of pre-hospital trauma notification calls.** James MK, Clarke LA, Simpson RM, et al. Amer J Emerg Med 2018, Published on-line
2. **Intravenous Low-Dose Ketamine Provides Greater Pain Control Compared to Fentanyl in a Civilian Prehospital Trauma System: A Propensity Matched Analysis.** Bronsky ES, Koola C, Orlando A, et al. Prehosp Emerg Care 2018, Published on-line.
3. **A Two-Center Validation of "Patient Does Not Follow Commands" and Three Other Simplified Measures to Replace the Glasgow Coma Scale for Field Trauma Triage.** Hopkins E, Green SM, Kiemeny M, Haukoos JS. Ann Emerg Med. 2018;72(3):259-269.
4. **Emergency Medical Services Simple Thoracostomy for Traumatic Cardiac Arrest: Post-implementation Experience in a Ground-Based Suburban/Rural Emergency Medical Services Agency.** Dickson RL, Gleisberg G, Aiken M, et al. J Emerg Med 2018;55:366-371.

1. **Accuracy of pre-hospital trauma notification calls.** James MK, Clarke LA, Simpson RM, et al. Amer J Emerg Med 2018, Published on-line

Notification of receiving hospitals of the transport and impending arrival of seriously injured trauma patients is an important step in the overall system of management for trauma patients. Pre-arrival notification allows the receiving hospital to prepare for the patient's arrival as well as inform and activate needed services with the goal of optimizing the care the victim receives. To date, no study has looked at the appropriateness, accuracy and completeness of these notifications.

In this study, the researchers included trauma patients that presented to the emergency department at an urban level 1 trauma center over a two year period, all of whom required the two highest levels of trauma activation (Tier 1 – critical patients with immediate surgical attending response; Tier2 – high risk patients with chief surgery resident response). Communication from the field to the ED staff came directly from EMS providers or from EMS dispatchers via phone and the information provided was recorded on internal pre-notification forms.

Over the course of this study, 2,186 trauma activations were initiated. Of these, pre-arrival notification occurred in 71.9% (1,572 cases) with 28% (614) providing no notification at all. They reported that while nearly one third of the patients arrived without any notification, those that did have prearrival notification often provided reports that were prone to errors that prevented adequate preparation for the patient's arrival. Incorrect information resulted in 1.7% (20) of the patients being under-activated and no notification resulted in 27% (593) being underactivated.

The limitations of this study include that these data represent a single, specific geographic region and a single trauma center and therefore may not be generalizable. The also recognized that

error by the ED staff when recording the prearrival information cannot be ruled out. In addition, communication difficulties related to language and/or influence of drugs or alcohol may also have affected the ability of the EMS personnel to get information from the patient or bystanders that would have been helpful to the hospital.

This study has shown that EMS providers in this particular system provide inadequate or incorrect information about their patients that results in significant underactivation of the trauma team by the trauma centers. The authors suggest that training offer a solution particularly with their BLS providers who were more prone transmitting incorrect or incomplete information about their patients

Early notification to the receiving hospital by EMS personnel of the transport and impending arrival of a seriously injured trauma victim is essential to ensure adequate preparation and appropriate team assembly in the emergency department. It is disturbing that, at least in this one system studied, inaccurate information is often being provided to the receiving hospital and in many cases notification is not occurring at all. Ensuring optimal survival of trauma victims requires the participation of an entire team of healthcare responders and that begins with the prehospital personnel.

2. **Intravenous Low-Dose Ketamine Provides Greater Pain Control Compared to Fentanyl in a Civilian Prehospital Trauma System: A Propensity Matched Analysis.** Bronsky ES, Koola C, Orlando A, et al. Prehosp Emerg Care 2018, Published on-line.

Analgesia is an important consideration for patients in the civilian prehospital trauma system. The epidemic abuse of opioid medications in the United States has led to an increase of opioid tolerant patients, increasing reluctance to provide narcotic pain relief, and the need to develop an effective, nonopioid analgesic alternative. Low dose ketamine can provide an analgesic effect comparable to the commonly used opioids such as morphine and fentanyl and unlike the narcotics is less likely to induce hypotension or respiratory depression. The United States military uses low dose ketamine effectively, and safely, for battlefield analgesia. This study hypothesized that ketamine and fentanyl would have differing analgesic effects in the civilian prehospital setting.

This study was a 24-month, retrospective, observational review of prehospital adult patients (age>18 years) who presented with severe pain (numeric rating scale, 7–10) and were treated in the field solely with either low-dose ketamine IV or fentanyl IV and subsequently were taken to the Emergency Department (ED) of a Level I Trauma Center. A regional protocol and state waiver permitting the administration of prehospital ketamine for the management of severe pain was followed. For IV administration of ketamine, the protocol prescribes 0.3 mg/kg IV every 20 minutes as needed, with a maximum of 3 doses. For IV administration of fentanyl, the same protocol guidelines suggest 2 μg/kg bolus over the course of 1 to 2 minutes, with an additional dose every 10 minutes as needed.

There were 200 patients in the initial study sample, 45% received ketamine and 55% were given fentanyl. The outcome measure used for this study was analgesic effectiveness based upon the change in pain score from pretreatment to after treatment with a fifty percent reduction in pain considered to be a positive response to the analgesic. Prior to treatment, pain scores were similar in both groups. Of those patients receiving ketamine IV, 67% achieved at least a 50% reduction in pain compared with 19% of those receiving fentanyl IV. Similarly, 25% of patients receiving fentanyl IV reported no change in pain score, as compared to 8% of the ketamine IV patients.

The authors also looked at the pre and post analgesia vital signs (blood pressure, respiratory rate, pulse, and GCS) of all patients included in the study before and after treatment. Adverse events were only reported for 4 patients, all of whom were in the fentanyl IV group. Two patients experienced respiratory depression while the other 2 demonstrated hemodynamic instability. The 2 cases of respiratory depression did not necessitate active airway management or mechanical ventilation, but

only supplemental oxygen. No patients in the ketamine group demonstrated any clinically significant adverse events.

This study demonstrates that low-dose ketamine IV is effective in reducing severe pain among adults while not significantly affecting vital signs and GCS. This study supports the implementation of and use of low-dose ketamine IV as a safe and effective alternative to opioids for civilian prehospital pain management.

3. **A Two-Center Validation of "Patient Does Not Follow Commands" and Three Other Simplified Measures to Replace the Glasgow Coma Scale for Field Trauma Triage.** Hopkins E, Green SM, Kiemeny M, Haukoos JS. Ann Emerg Med. 2018 Sept; 72(3):259-269.

The Glasgow Coma Scale (GCS) is a routine part of the trauma assessment for both prehospital providers as well as the hospital trauma team. Additionally, the GCS is a critical component of the prehospital trauma triage algorithm as written in the Centers for Disease Control and Prevention National Field Trauma Triage Guidelines. There have been many criticisms of the GCS. The GCS is complicated to calculate and unreliable. It has several subjective elements and has a low interrater reliability. Even the most experienced trauma providers have difficulty remembering all components of the GCS. The GCS predicts survival well at the extremes of its scores but is very poor at predicting survival in its midrange. In 2016 Kupas et al demonstrated from a statewide database of 393,877 patients that a GCS motor score less than 6 ("patient does not follow commands") had similar performance in prediction of trauma outcomes to the full GCS.

The goal of this study was to perform an external validation of the motor GCS score less than 6 as a predictor of trauma center need. Additionally the authors tested the accuracy of three other out-of-hospital scoring systems: motor GCS less than five, the Simplified Motor Score, and the "alert, voice, pain, unresponsive" (AVPU) assessment. These four systems are noted below:

1) mGCS < 6
   - Patient does not follow commands
2) mGCS < 5
   - Patient does not obey or localize
3) Simplified Motor Score
   - Obeys commands
   - Localizes pain
   - Withdrawal to pain or less response
4) AVPU
   - A - alert
   - V - responds to verbal stimuli
   - P - responds to painful stimuli
   - U - unresponsive to all stimuli

The authors included all adult and pediatric trauma patients identified in the trauma registries from two regional level I trauma centers. Outcome measures included emergency intubation, clinically significant brain injury, need for neurosurgical intervention, Injury Severity Score greater than 15, and mortality. Clinically significant brain injury was defined as a skull fracture or basal or skull fracture with corresponding evidence of brain laceration, hemorrhage, or contusion; cerebral laceration or contusion; subarachnoid hemorrhage; subdural hemorrhage or epidural hematoma; and other unspecified intracerebral hemorrhage after injury. Neurosurgical intervention was defined as the need for craniotomy, intracerebral pressure monitoring, ventriculostomy, or any other procedure performed in

the operating room by the neurosurgeon. Placement of skull tongs or halo traction devices for spine injury was not counted as a neurosurgical intervention. When analyzing the AVPU score the authors used: A= alert: total GCS=14 or 15; V= verbal response: verbal GCS score greater than 1 but with total GCS score less than 14; P= painful response: anything not "a", "v", or "u"; U= unresponsive: GCS=3.

The authors found that motor GCS score less than 6 was essentially identical to the GCS score less than or equal to 13 for the prediction of the five outcomes being studied. Similarly, the motor GCS score less than 5 demonstrated nearly identical results to motor GCS score less than 6. The AVPU scoring showed essentially equivalent results to the standard GCS score less than or equal to 13 metric. Limitations of this study include the need to impute data due to missing data in approximately one-third of the patients. Also only two trauma centers were used and their patient populations may not be applicable to all populations.

This study validates the prior study by Kupas et al, who found that a simple calculation of a GCS motor score less than 6 ("patient does not follow commands") predicted trauma outcomes as effectively as the current standard of GCS score less than or equal to 13. Prehospital trauma triage could be simplified by switching to this modified "patient does not follow commands" triage system.

4. **Emergency Medical Services Simple Thoracostomy for Traumatic Cardiac Arrest: Post-implementation Experience in a Ground-Based Suburban/Rural Emergency Medical Services Agency.** Dickson RL, Gleisberg G, Aiken M, et al. J Emerg Med 2018;55:366-371.

The insertion of a thoracostomy (chest) tube is the standard treatment for pneumothoraces in the hospital environment, but is not commonly performed in the prehospital environment in the USA. This retrospective study examined the use of Simple or Finger Thoracostomy (ST) in patients in traumatic cardiac arrest with suspected tension pneumothorax and compared it to a control group of patients treated with needle thoracostomy (NT).

This study was conducted in a large metropolitan area with data from June 2013 to July 2017. ST was performed on fifty-seven (57) patients with traumatic cardiac arrest and compared to a historical group of fifty (50) patients who underwent NT. The ST group used a surgical incision at the fourth intercostal space midaxillary line with a blunt finger dissection and clamp penetration to reach the pleural space. The NT was performed with a standard 14-g, 4.5 cm angiocath in the second intercostal space midclavicular line or the fifth intercostal space midaxillary line. Of the 57 patients that received ST, 40 (70%) were blunt trauma and 17 (30%) were penetrating. The presenting rhythm was Pulseless Electrical Activity rhythm (PEA) in 65% of the patients, asystole in 26% and VF or VT in 4%. Of the study group 75% had bilateral ST performed. Thirty-two (32) percent of the patients had air return and 25% had ROSC with 11% surviving to 24 hours. Four of the 57 (7%) were discharged from the hospital with normal intact mental status. Of the survivors all were blunt trauma that presented with an initial rhythm of PEA. When comparing ST vs. NT that there were no differences between transport times for each group, NT 15.33 vs ST 17.04 minutes. Procedures were on scene vs. during transport were also similar. There was no statistically significant difference in ROSC between the two groups, NT 9/50 vs. ST 14/57, however while not statistically significant 4 patients in the ST group were discharged to home vs. none in the NT group. There were no reported injuries to EMS personnel during the study period. There were three (3) complication noted in the ST group, two (2) being extrapleural placement without reaching the plural space and one (1) case of diaphragm and liver injury.

The results of the study are interesting on many aspects. First this study demonstrated that chest decompression in Traumatic Cardiac Arrest victims only obtained the desired outcome of ROSC in those patients that presented with Blunt Trauma with a presenting rhythm of PEA. While not statistically significant, the only survivors to discharge were in the ST group (7%) vs. the NT group (0%). Of interest, in the group that received NT, the procedure was performed with a 4.5 cm, 14 gauge angiocatheter.

While the authors concede that the catheter length used in NT during this study period was sub-optimal, had a longer catheter been utilized during the study period, the NT statistics may have changed (the Tactical Combat Casualty Care program recommends the use of an 8cm long, 10 - 14 gauge catheter for needle decompression of the chest). The authors point to the reported failures of NT to enter the chest and the complications rates of 3-30% for tube thoracostomy as justification to perform ST over either procedure in the field. Given the limitations of this study (small sample size and inadequate needle length), additional studies need to be performed before ST can be recommended to replace NT in the standard ground transportation EMS systems in the US.