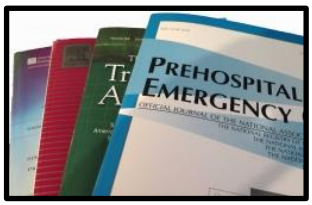
International Prehospital Medicine Institute



IPHMI Literature Review

Keeping You Up To Date with Current EMS Literature and Studies

Vol. 4.4

1. **Prehospital FAST reduces time to admission and operative treatment: a prospective, randomized, multicenter trial.** Lucas B, Hempel D, Otto R, et al. *Eur J Trauma Emerg Surg* 2021. Open Access, Full text available at: https://link.springer.com/article/10.1007/s00068-021-01806-w
2. **Ambulance deceleration causes increased intra cranial pressure in supine position: a prospective observational proof of principle study.** Maissan IM, Vlottes B, Hoeks S, Bosch J, Stolker RJ, den Hartog D. *Scandinavian J Trauma, Resusc and Emerg Med* 2021;29:87. Open Access, Full text available at: 87 https://doi.org/10.1186/s13049-021-00904-3
3. **Isolated vehicle rollover is not an independent predictor of trauma injury severity .** Moriarty S, Brown N, Waller M, Chu K. *JACEP Open* 2021;2:e12470. Open Access, Full text available at: https://doi.org/10.1002/emp2.12470
4. **Association of Helicopter vs Ground Emergency Medical Transportation With 1-Year Mortality in Denmark.** Alstrup K, Rognås L, Sollid S, Johnsen SP, Valentin JB, Petersen JAK. *JAMA Network Open.* 2021;4(1):e2033318. Open Access, Full text available at: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2774741

1. **Prehospital FAST reduces time to admission and operative treatment: a prospective, randomized, multicenter trial.** Lucas B, Hempel D, Otto R, et al. *Eur J Trauma Emerg Surg* 2021. Open Access, Full text available at: https://link.springer.com/article/10.1007/s00068-021-01806-w

Ultrasound is utilized in the trauma center for rapid detection of intraabdominal bleeding, which can facilitate transport to the operating room if necessary. The Focused Assessment with Sonography in Trauma (FAST) exam looks at the dependent areas within the abdominal cavity where blood may pool to look for the presence or absence of intraabdominal hemorrhage. With advancing technology, prehospital use of ultrasound is now a possibility as the machines have become smaller and easier to store on an ambulance. Use of prehospital ultrasound has been limited by the cost of the machines, training of the personnel, and insufficient data to suggest that its use improves outcomes.

This is a prospective, randomized, multicenter trial conducted in Germany over 33 months to analyze the impact of prehospital ultrasound use on in-hospital outcomes of trauma patients. The primary study outcome was determining the time from prehospital ultrasound to admission to the trauma room and/or time to surgery. The secondary study outcome was analyzing the effect of prehospital ultrasound on prehospital decision-making. Six ambulances staffed 24 hours per day with an emergency physician and paramedic, as well as one rescue helicopter, were studied. All trauma patients in whom blunt abdominal trauma was suspected were included. During even calendar weeks, the patients underwent their usual clinical exam (CEX) as well as a prehospital FAST (CEX-pFAST). During odd calendar weeks, the patients only received a standard CEX without p-FAST). In the hospital, CT scan of the abdomen was the gold standard for diagnosing free fluid and solid organ injury. For the primary

outcome, the time from first prehospital examination to admission to the trauma room and time to operation were recorded. For the secondary outcome, changes in prehospital treatment strategy (including "permissive hypotension," "small volume resuscitation," "no volume replacement," and "establishing of further venous access") were documented.

A total of 242 blunt trauma patients were included in the study. CEX-only was performed on 100 patients (41.3%) and CEX-pFAST was performed on 142 patients (58.7%). The median injury severity score (ISS) was 14 in the CEX group and 17 in the CEX-pFAST group. On admission to the trauma room, the treating physician classified 93.4% of the patients as stable and 6.6% as unstable. The sensitivity of detecting intraabdominal free fluid was higher in the CEX-pFAST group (94.7%) compared to the CEX-only group (80%). For both groups the time to admission to the trauma room was similar. However, in those patients in whom intraabdominal free fluid was suspected, the time to the trauma room was less in the p-FAST group (25 minutes versus 38 minutes). The use of CEX-pFAST decreased time to operation compared to CEX-only (135 min vs 150 min) for all operations however only 7 patients required urgent abdominal exploration.

This is an interesting study documenting a potential benefit to the use of prehospital ultrasound for trauma. However, it is not applicable to the trauma system in the United States. Physicians are not a routine part of staffing of ambulances in the U.S. Additionally, the time to urgent operation in these study patients is significantly longer than what is usually found in U.S. trauma centers, where unstable patients are routinely taken to the operating room within minutes of arrival at a trauma center. Finally, the study population was not severely injured. The average ISS of these patients was 14-17. A patient with an ISS > 15 is considered to have major trauma, and those with an ISS > 25 are considered severely injured. This study population was not severely injured, with only 7 total patients requiring urgent abdominal surgery.

In summary, this study demonstrates a potential benefit for prehospital ultrasound in managing blunt trauma patients. However, given the differences in EMS and trauma systems, this study does not apply to the United States and should not change practice.

2. **Ambulance deceleration causes increased intra cranial pressure in supine position: a prospective observational proof of principle study.** Maissan IM, Vlottes B, Hoeks S, Bosch J, Stolker RJ, den Hartog D. Scandinavian J Trauma, Resusc and Emerg Med 2021;29:87. Open Access, Full test available at: 87 https://doi.org/10.1186/s13049-021-00904-3

TBI is one of the leading causes of death for young people. Death from TBI may be a result of the primary injury to the brain or from secondary injury such as increased intracranial pressure (ICP) and the resulting decrease in cerebral blood flow.

It has long been surmised that deceleration during the supine transportation of patients with acute TBI may worsen ICP. The authors of this local IRB full review waived; observational study attempted to determine if head elevation during transport, and subsequent deceleration, affects ICP. There exists a proven relationship between increased ICP and optical nerve sheath diameter (ONSD) as measured by ultrasound. When ICP increases, the diameter of the ONSD will also increase because cerebro-spinal fluid moves freely within the optical nerve sheath.

Twenty, healthy, adult (age > 17) volunteers from the Hollands Midden Ambulance Service in the Netherlands were recruited for the study. Each test subject was secured to a Kendrick Extrication Device and a bicycle helmet specially outfitted with an ultrasound device and an ocular focusing device. The subjects were then secured to an ambulance gurney and loaded head-first into the vehicle. A trained ambulance driver drove the vehicle on a closed test track. A sonographer accompanied the test subject on every pass on the track and recorded OSND results.

A pretest ultrasound measurement was taken of their OSND diameter (flat and at 30 degrees head elevated). For each pass on the test track, the ambulance accelerated to 50 km per hour and then decelerated to 0 km per hour over a 10m distance and repeat measurements were obtained. The investigators considered an OSND change of > 0.2 mm from baseline to be clinically significant.

With the gurney flat and test subject supine, the baseline and subsequent braking ONSD diameters were measured at 4.8 mm (IQR 4.80-5.00) and 6.0 mm (IQR 5.75-6.40). With the head of the gurney elevated to 30 degrees, the baseline and braking ONSD diameter measurements were 4.8 mm (IQR 4.67-5.02) and 4.9 mm (IQR 4.80-5.02). This study demonstrated a 24% increase of the ONSD while decelerating in the supine position and a 0% increase while positioned in the 30 degree head up position. All twenty of the test subjects experienced > 0.2 mm OSND diameter increase while braking supine, whereas only five of the twenty test subjects had a > 0.2 mm increase while braking at 30 degrees head up.

This study is limited by the fact that otherwise healthy test subjects, in small numbers, were used in a very controlled deceleration environment. In addition, there was no way to blind the ultrasonographer to the study and patient conditions.

The evidence does suggest, despite the limitations, that ambulance deceleration has the potential to increase ICP and that transporting TBI patients in a 30 degree head up position may deter secondary brain injury from deceleration induced increases in ICP.

3. Isolated vehicle rollover is not an independent predictor of trauma injury severity . Moriarty S, Brown N, Waller M, Chu K. *JACEP Open* 2021;2:e12470. Open Access, Full text available at: https://doi.org/10.1002/emp2.12470

Determination of the mechanism of injury has long been part of every prehospital provider's education and daily practice. For many years a rollover motor vehicle crash (MVC) was considered to elevate the index of suspicion for greater resulting injury. As a result, many prehospital triage protocols mandated that patients involved in rollover MVC be transported to a trauma center. Some EMS systems would even launch a medical helicopter on the report of a rollover MVC.

This was a retrospective observational study to determine if the injuries sustained in rollover MVCs justify inclusion of this mechanism into prehospital triage criteria.

The authors enrolled patients older than 15 years of age who were involved in an MVC during the study period of July 2012 to June 2016 as identified from the hospital's trauma registry. The hospital is a level one trauma center (1 of 2) in the city of Brisbane Australia serving a city with a population of over 2.4 million. The hospital's emergency department receives over 90,000 patients a year and is the primary recipient of trauma patients from aeromedical transports as well as the local ambulance service. The primary outcome was major trauma defined as an ISS of >15, major surgery, ICU admission or in-hospital death. Five variables were extracted from the trauma registry: rollover, estimated speed, entrapment, encapsulation, and death on the scene. The authors defined motor vehicle rollover as at least a quarter turn onto the vehicle side or greater as determined by the prehospital paramedics. Mixed mechanism was defined by the authors as a rollover with other secondary mechanisms of injury. These included planar impact with another vehicle or object, ejection, entrapment, or encapsulation.

During the study period there were 2446 motor vehicle crashes of these there were 423 (17%) that were categorized as rollovers. These rollover crashers were further broken down to isolated (197) vs. mixed mechanism (227). Of the two groups, isolated rollover crashes resulted in 18 (9.5%) patients being classified "with major injury, compared to 61 patients (27%) of those classified as mixed mechanism. This represents a three and a half times increase in severe injury for the mixed mechanism group.

The authors note quite a number of limitations to the study. The first was a selection bias as patients treated at another hospital but not transferred to the study hospital were not included. Confusion over the classification schema of isolated versus mixed mechanism by the on-scene paramedics may have affected the results. Paramedics were also asked to estimate the speed of the vehicle based upon observation while caring for the patient.

The authors conclude that the prediction of major injury based upon an isolated rollover MVC without complicating factors such as entrapment or planar impact is not supported and that transport to a trauma center and trauma team activation may not be required. This echoes the removal of "rollover" from the Guidelines for Field Triage of Injured Patients recommendations published by the Centers for Disease Control.

4. **Association of Helicopter vs Ground Emergency Medical Transportation With 1-Year Mortality in Denmark.** Alstrup K, Rognås L, Sollid S, Johnsen SP, Valentin JB, Petersen JAK. *JAMA Network Open.* 2021;4(1):e2033318. Open Access, Full text available at: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2774741

Helicopter transport is often useful in getting critical patients to specialty care centers but whether flying is better for emergency patients than ground transport continues to be the subject of controversy.

The authors conducted a retrospective nationwide study with data from Danish helicopter registry, the Danish Civil Registration System (mortality information) and the Danish national Patient Register for specific diagnoses. The primary analysis looked at patients from October 1, 2014 to April 30 2018 accepted for helicopter missions and for patients transported by ground ambulance because requested helicopters were unavailable to respond. The secondary analysis looked at patients assigned an ICD-10 diagnosis considered a critical illness or injury.

There were 10,618 patients included in the primary analysis with 9,480 patients transported by helicopter and 1,138 transported by ground. Adjusted cumulative 1-year mortality was 23.2% for all patients transported by helicopters vs 24.5% for patients transported by ground which was not statistically significant. Further, they reported that 2,260 of the patients transported by helicopter had critical illness or injuries compared with 315 of the patients transported by ground. The adjusted cumulative one-year mortality for these patients was 25.1% for air transport and 27.1% for ground, again not statistically significant. In addition, the adjusted cumulative mortality at 1 day and day 30 was not different for these groups of patients.

There were a number of limitations to the study. There were substantial missing Civil Registration System numbers which compromised follow up of some patients. This could result in a lack of robustness due to possible selection bias as patients with missing or duplicate numbers were excluded from the study. While documented injury severity scores of 15 or higher would have been preferable as a measure of severity, these numbers were not available in their database. This study only looked at trauma patients for whom helicopters had been requested for and compared them to those patients transported by ground when the helicopter was unavailable. There is a whole population of trauma patients transported by ground ambulance for whom a helicopter was not requested and was not studied. Lastly, this study would have benefitted by a critical analysis of the over 7,000 patients that were transported by helicopter that were deemed not have been in the critical category and whether or not helicopter transport was truly warranted.

This study showed a very slightly lower mortality in helicopter transports of critical patients that was not statistically significant, whether analyzed at day 1, day 30 or day 365. This study contributes to the continuing effort to describe the utility of air transport for patients; however more research needs to be done to document the benefit, if any, of helicopter transport and the best use of available resources. In addition, further study is needed to determine whether optimizing dispatch systems and more selective

helicopter dispatch might be associated with further improvements in survival among selected patients and minimize unnecessary air transports.