

Paramedic CAT (Critically Appraised Topic) Worksheet

Title: Does HEMS transport improve outcome in single system trauma injuries compared to ground transport?

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Topic Overview:

For this topic, there are no major studies on this topic specifically therefore, this appraisal is required. This is an important topic as the decision to transport through HEMS or ground transport is a common dilemma for traumatic injuries.

Clinical Scenario:

You are called code 1 to a male with an isolated spinal trauma from a motor-vehicle accident. Patient is in critical condition and deteriorating with respiratory rate decreasing and tachycardic heart rate. You are 40 minutes from the nearest trauma centre and decide to transport patient with HEMS because of higher qualifications and seemingly quicker to hospital. Has this improved this patient's outcome or was ground transport an adequate way of transport?

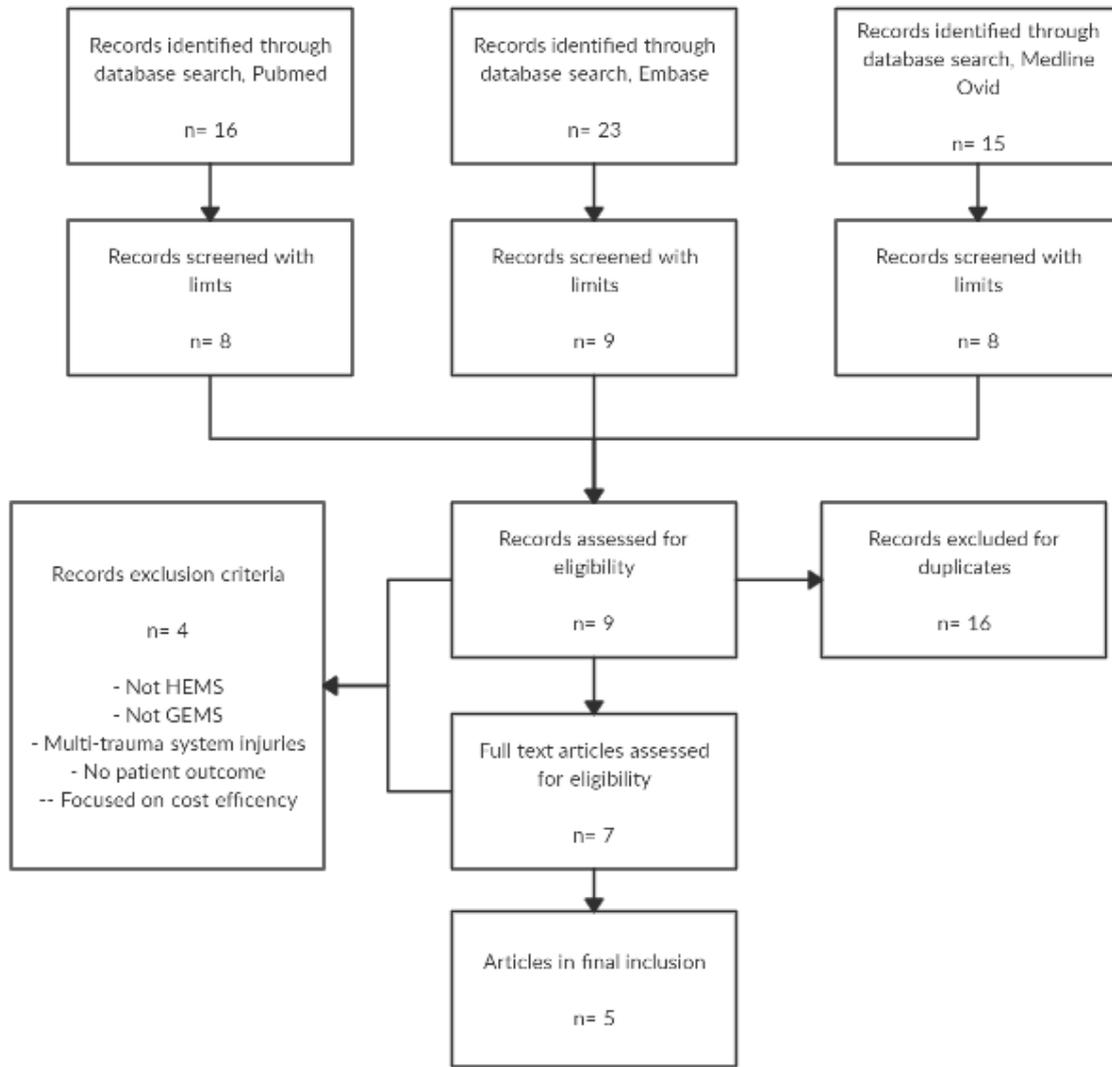
PICO (Population – Intervention – Comparison – Outcome) Question:

In patients that have acquired single system trauma injuries, will helicopter emergency medical services (HEMS) improve patient outcome compared to ground emergency medical services (GEMS)?

Search Strategy:

These are the keywords used in different combinations to retrieve the results from the databases, Medline Ovid, Embase and Pubmed: (“HEMS transport” OR HEMS OR “helicopter emergency medical services”) AND (“single system” OR trauma OR “trauma injuries”) AND (“ground transport”). The limits used when researching were human studies, English language and studies from 2014 to current date.

Search Outcome:



Relevant Papers: 5

Author, Date	Population: Sample Characteristics	Design	Outcome	Results	Strengths and Limitations
Taylor, Rasnake, McNutt, McKnight, & Daley, 2018	There were 1,006 patients with blunt traumatic injuries used between 2010 to 2015: 478 HEMS and 528 GEMS. The age range was from 16 to 65 and the average age of the patients	Retrospective	Analysis of the outcomes of blunt trauma patients transported by either HEMS or GEMS from within a moderate distance, or a 45-minute ground transport time,	HEMS scene-to-ED time average was 41.6 minutes and had a total mortality of 0.145. GEMS scene-to-ED time average was 22.2 minutes and had a total mortality of 0.099.	(-) Only analysed patients within moderate distance of a trauma centre (-) Study population was contained within a single catchment area (-) Retrospective study, thus unable to extrapolate any mechanism

	<p>included was 38.4 years old. The setting of this study was an urban setting in the United States.</p>		<p>to the emergency department (ED)</p>	<p>Ultimately, rapid ground transport should be used in blunt trauma patients when the scene is up to a moderate ground distance away from the trauma centre and there would be a moderate-to-prolonged HEMS response time.</p>	<p>behind the outcomes reported nor able to establish a cause and effect relationship (+) Used two different statistical models to control possible confounding variables (-) Study populations between HEMS and GEMS not completely homogeneous (-) Missing data not addressed (+) Large sample size (-) Rural setting underrepresented</p>
<p>Chen, et al., 2018</p>	<p>There were 153,729 patients included from 2000 to 2013 for this study. Additionally, the age range was 16 years and older however, older males were more common in the results. The study was conducted in an urban environment in the United States.</p>	<p>Retrospective</p>	<p>Identify patient groups that may benefit from HEMS even when prehospital time for helicopter utilisation is longer than GEMS transport.</p>	<p>The HEMS transport time was 50 minutes whereas, GEMS was 35 minutes. There were 22% higher odds of survival for patients transported by HEMS compared to GEMS. Only patients with a prehospital respiratory rate less than 10 bpm or greater than 29 bpm, prehospital GCS score of 8 or less, or a hemothorax or pneumothorax had a survival</p>	<p>(+) Propensity score matching was employed to address selection bias (+) Multiple imputation was performed for analysis variables missing less than 30% of observations to mitigate missing data (+) Excluded any patients who didn't meet HEMS criteria (-) Data was not collected specifically for this study, limiting variables for analysis</p>

				benefit associated with HEMS transport despite faster GEMS transport, while there was no association between transport mode and survival in patients without these criteria.	(-) Long-term outcome data and quality of life indicators were not available (+) Large sample size
Aiolfi, et al., 2018	Patients with isolated severe blunt traumatic brain injuries from 2007 to 2014 were included in this study. There were 145,559 patients: 116,391 GEMS and 29,168 HEMS. The age range was 16 years and older and the study was conducted in an urban setting in the United States.	Retrospective	Compare outcomes in patients with isolated severe blunt traumatic brain injuries transported by HEMS or GEMS.	The HEMS transport had a transport time of 41 minutes and mortality of 12%. On the other hand, GEMS transport had a time of 25 minutes and mortality of 7.8%. HEMS patients had significantly more complications such as, a longer in-hospital length of stay, ICU length of stay, and mechanical ventilation days: 3 days ventilation, 3 days ICU stay, 5 days hospital stay. Whereas GEMS, had 3 days ventilation, 2 days ICU stay, and 3 days hospital stay. In patients with severe isolated blunt TBI, HEMS may	(-) Lack of information on crew composition, expertise and level of staffing (+) Large sample size (+) Focus on only a single system (+) Strict inclusion criteria removed potential confounding variables (-) Rural setting underrepresented

				have a survival advantage over GEMS and the use of HEMS for this patient population should continue and be encouraged.	
Abe, Takahashi, Saitoh, & Tokuda, 2014	From 2004 to 2011, 24,293 patients were included in this study: 2,090 HEMS and 22,203 GEMS. The age range was 15 years and greater: the mean ages were 56.2 for HEMS and 53.1 for GEMS. The setting of the study was in Japan.	Prospective and Observational	Analyse the association between the use of helicopters with a physician versus ground services and survival among adults with serious traumatic injuries.	The survival rates of patients transported by HEMS were significantly greater than those transported by GEMS. HEMS had a survival discharge at 1.714 and survival at ED of 3.075. GEMS had a survival discharge at 1.220 and survival at ED of 1.822. The results of this study demonstrate that transport by helicopter with a physician may be associated with improved survival to hospital discharge compared to GEMS, after controlling for multiple known confounders among patients with major trauma in Japan. Probably the combination of elements of	(-) Absence of distance and time information (-) No control for staffing in each vehicle (-) Missing data that can influence results (+) Used propensity score approach to condition potential selection bias and confounding (+) Large sample size

				HEMS has benefits for patients with trauma, although the study could not detect the most likely contributing factor.	
Foster, et al., 2014	Between 2006 to 2007 this study included 274 patients with isolated spinal injuries. Additionally, it was conducted in an urban environment in the United States.	Retrospective	Determine whether ground transport for interfacility transfer of patients with spinal injury resulted in less favourable clinical outcomes compared with HEMS.	HEMS had a transport time of 80 minutes whereas, GEMS had a transport time of 112 minutes. There was no deterioration in neurologic examination occurred in patients who underwent GEMS nor was there any radiographic evidence of worsening injury attributable to the transportation process.	(-) Small sample size (-) No deterioration found (-) Focused on urban environment thus results biased towards GEMS (-) Only a year study (+) Focus on only a single system (+) Listed variables that effected the study

Comments:

- The majority of these articles state that GEMS has better patient outcome in an urban setting. This is because with all the studies GEMS had a faster transport time to the trauma centres. However, most articles stated that HEMS only was slower because of the process they must take to fly the helicopter but if it was in a rural setting the HEMS would be faster and have better patient outcome.
- Only two articles stated specifically that the study was focused on single system trauma injuries whereas, the others did not state if it was single or multiple systems involved in the injuries the patients had acquired.

Consider: *Would you change the use of HEMS compared to GEMS based on these articles?*

Based on the relevant articles a change in practice is not recommended due to a lack of diversity with the settings and distance to trauma centres. This is because the articles did not consider rural versus urban setting and the process HEMS must perform with each flight.

This includes pre-flight check, lift off, fly to the scene, land and assume care, then lift off again and land at the receiving facility which can take longer than GEMS overall.

Clinical Bottom Line:

For single system trauma injuries GEMS has better patient outcomes when within a moderate distance or less than 45 minutes to a trauma centre and in an urban environment. However, if in a rural setting and there is a large distance to a trauma centre HEMS is preferred to maximise patient outcome.

References

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