Pre-hospital factors that lead to increased mortality and morbidity in trauma patients in developing countries: a systematic review

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Research Question

To identify and categorize the contributing prehospital factors that lead to increased mortality and morbidity in trauma patients in developing countries.

Introduction

Trauma is a growing global concern and the WHO estimates that injuries account for one-sixth of the global adult disease burden. Furthermore, there is a disproportionate number of trauma related deaths that occur lower middle-income countries compared to higher income countries. Studies show that deficiencies in care in preventable related deaths include pre-hospital delays, delays in treatment and inadequate resuscitation. Additionally, most trauma related deaths occur in the prehospital setting and it is in the lower to middle income countries where structured emergency medical services are lacking.

Materials and Methods

PubMed/MEDLINE, EMBASE, and Cochrane were used to identify relevant peer-reviewed literature describing or evaluating prehospital emergency care in trauma patients in developing countries. Studies included for analysis included those that reported prehospital interventions or lack of interventions in trauma patients in developing countries. Interventions included triage, airway management, oxygen administration, intravenous fluid administration, splinting, spinal immobilization, wound care, and patient transport time. The outcome assessed was patient morbidity and mortality.
Studies that were not conducted in a developing country and non-English articles were excluded after title and abstract review. Only primary journal articles published in English were included in this analysis. Articles were excluded from analysis if they did not contain any pre-hospital data and were not focused on trauma patients.

Keyword search strategies
The following search strings were utilized:
“developing countries (MeSH) AND Emergency Medical Services (MeSH)”
“(prehospital emergency response) AND "Developing Countries” [Mesh]”
“prehospital intervention AND Developing Countries [MeSH]”
“Prehospital Emergency Response AND Third World Countries”

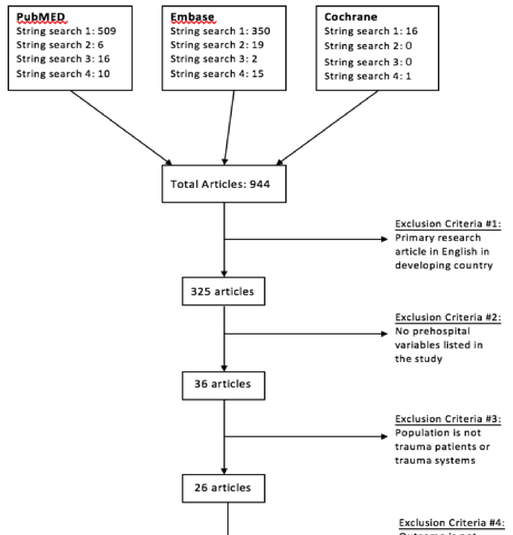

Figure 1: Exclusion methodology flowchart

Results

There were 8 studies that met our predefined inclusion criteria.

Article	Population	Country	Barriers	Injuries	Results
Al-Tahani, et al.	n = 482	Qatar	Transfer time, intubation	Trauma patients requiring intubation	Prehospital Intubation = avg total EMS time of 64.3 +/- 20.9 minutes with mortality percentage of 53%. ER intubation = avg total EMS time of 51.7 +/- 21.9 with mortality percentage of 18.5%.
Arreola-Risa et al.	n = 3,786	Mexico	Pre-hospital care	Blunt/penetrating trauma	This study looked at the rates of EMS interventions before, during, and after EMT certification) course. There was no data to calculate odds ratio.
Hasmi, et al.	n = 1,227	Pakistan	Pre-hospital delay	Blunt/penetrating trauma	1-6h: Complications = 1.61 (0.99-2.61)* and Mortality = 1.15 (0.64-2.07) >6 h: Complications = 2.38 (1.409(4.05)** and Mortality = 1.51 (0.78-2.95).
Joosse, et al.	n = 97	Indonesia	Pre-hospital delay, prehospital care	Trauma patients with multiple injuries	Time from injury to ER in Survivors = (8.29 +/- 20.20) and in Non-survivors = (1.91 +/- 2.12). In 49 cases (50%), there was no prehospital care at all. In the other 48 cases, there was inadequate prehospital care in 31 cases (31%), and adequate prehospital care was delivered in 17 cases (18%).
Khan, et al.	n – 978	Pakistan	Pre-hospital delay	Trauma patients	Average time of injury to emergency room was 4.7 hours. Dead patients had avg of 6.2 hours while alive patients had avg of 4.6 hours
Mock, et al.	n = 1,348	USA, Mexico, Ghana	Pre-hospital delay, pre-hospital care	Traumatic injury excluding burns, strangulation, hanging, poisoning	Ghana: 85/171 patients had prehospital delays > 1 hour Mexico: 107/239 patients had prehospital delays > 1 hour. 70% of hypotensive patients had intravenous fluid administration enroute, the remaining 30% did not
Sethi, et al.	n = 484	Malaysia	Pre-hospital delay	Injuries (motor vehicle, falls, industrial, assaults, penetrating)	Transport time </= 1 h = 6.8% dead. > 1h 0% dead.
Yeboah, et al.	n = 84	Ghana	Pre-hospital delay	Trauma patients	Prehospital delays accounted for the barrier to 22 preventable deaths.

Table 1: Data of included studies

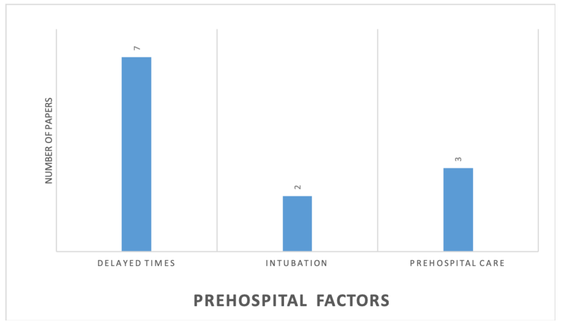

Figure 2: Prehospital factors listed as variables in papers

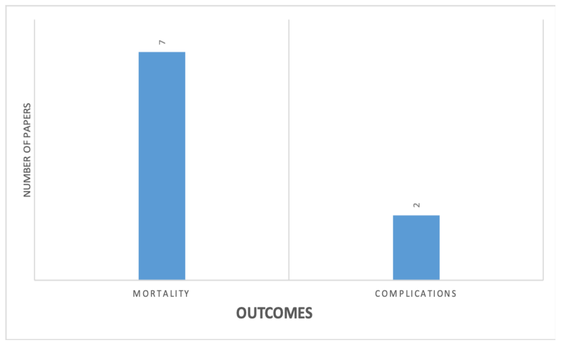

Figure 3: Number of papers that discussed patient mortality or morbidity as outcomes

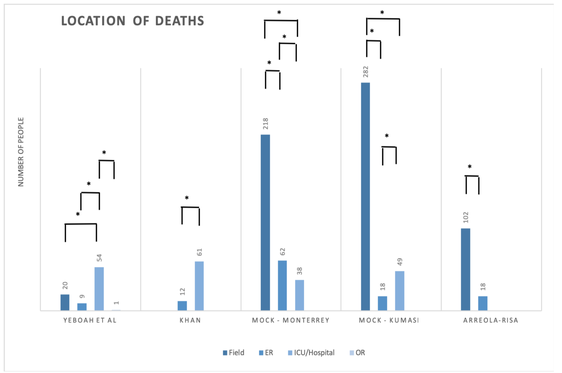

Figure 4: Location of deaths

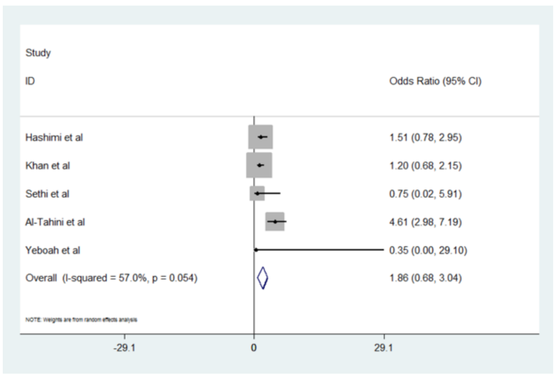

Figure 5: Meta-Analysis of the association between prehospital delay and mortality.

Discussion

In this study, we aimed to identify and categorize the contributing prehospital factors that lead to increased mortality and morbidity in trauma patients in developing countries. In this systematic review, we were able to analyze data from eight studies. Only prehospital delay had enough papers with data and thus was the only factor we were able to perform a meta-analysis. Our analysis found that patients who experienced a prehospital delay had an 86% increase in mortality. While univariate analysis demonstrated that prolonged scene time was associated with increased mortality, this was not statistically significant.
Limitations may have influenced the outcome of this study and need to be addressed. While low- and middle-income countries carry the heaviest global burden of injuries, a scarcity of trauma and injury data exists. Consequently, there is an apparent lack of quality research conducted and there are limited number of epidemiologists and other trained researchers, and there is little funding support.
Moving forward, it should be a goal for countries and their governments to establish a central clearinghouse of health information, especially trauma registries. Additionally, more research in developing countries should be conducted to begin to ameliorate the paucity of literature that can then start driving evidence-based improvements and initiatives in healthcare.

Conclusion

This study adds to the scarce literature how a lack of prehospital infrastructure is associated with an increased likelihood of mortality. It also highlights the importance and necessity of an increase in quality primary research conducted in developing countries.

Acknowledgements

I would like to thank my mentor, Dr. David Beyda and Kathleen Carlson for their help in developing this research project.