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Essay/Report title: Critically Appraised Topic in Trauma

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Topic Overview

Title.

The Impact Focused Assessment with Sonography for Trauma (FAST) has on Patient Health Outcomes in the Context of Prehospital Trauma

Clinical scenario.

You are dispatched code 1A to a 26-year-old female who has reportedly been hit by a garbage truck. On arrival, you find the patient on the roadside with significant blunt thoracoabdominal trauma. The High Acuity Response Unit arrives and they perform a FAST examination on the affected region and find free fluid in the peritoneal space. The patient is then immediately conveyed to a level one trauma centre.

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

In adult and paediatric patients known to have a traumatic injury, does the use of FAST on-scene improve health outcomes?

Search Strategy

The medical electronic databases Ovid MEDLINE, PubMed, and EMBASE were used to locate literature published within the preceding 10 years (August 2009 to current August 2019).

The keywords and search headings used include: (focused assessment with sonography for trauma OR FAST OR sonography OR ultrasound OR echography) AND (pre-hospital OR prehospital OR out of hospital OR out-of-hospital OR ambulance OR paramedic* OR emergency medical service* OR EMS OR emergency physician*) AND (trauma OR abdominal trauma OR thoracic trauma OR pelvic trauma OR pericardial OR peritoneal OR pleural) AND (adult* OR paediatric* OR neonate* OR patient outcome OR mortality OR morbidity).

Articles consisting of any study design were included if they discussed the use of FAST in the prehospital context and the impact this diagnostic tool has regarding the health outcomes

of paediatric and adult patients exposed to traumatic injury. Refer to Figure 1, in the Appendix, for a diagrammatic representation of the exclusion process.

Study Results and Analysis

Table 1

Summary and Analysis of Included Results

Author(s)/date	Population: sample characteristics	Design and LOE	Outcomes	Results	Limitations/strengths
Bøtker, Jacobsen, Rudolph, and Knudsen, 2018	From 27 studies, paediatric/adult patients experiencing varying forms of traumatic injury across disparate settings were included. The pooled sample size of these patients is not provided.	Systematic review LOE=1	Primary outcome was to measure FAST's impact on patient survival. Secondary outcomes measured changes in management, diagnostic accuracy, and FAST examination feasibility.	Found prehospital FAST positively impacts patient management and predicted the requirement for prehospital and in-hospital interventions. Identified a pronounced gap in evidence regarding whether FAST improves outcomes in trauma patients.	(-) The sample size was not stated. Additionally, the included studies presented were heterogenous in nature rendering comparative results potentially invalid. A significant proportion of included studies were also assessed to be of low quality adding further doubt regarding reliability. Additionally, publication bias is present within this review as the authors acknowledged studies presenting neutral conclusions may have been excluded. (+) Through the utilisation of checklists, this study appropriately presented and recognised the quality of disparate studies included. This study, through extensive review of available literature, identified gaps in contemporary

					knowledge. Additionally, this study suggested ways to ethically randomise trauma patients, addressing gaps in research associated with FAST use and patient outcomes.
Champagne, Eadie, Regan, and Wilson, 2019	2360 adult/paediatric patients, from 26 studies, were included. These patients presented with various occult and pronounced upper/lower limb fractures in various rural and urban settings.	Systematic review and subgroup meta-analysis LOE=1	Primary outcome measured was the diagnostic accuracy of FAST. Secondary outcomes measured related to the affect implemented interventions had on patients.	Found that prehospital FAST demonstrated excellent diagnostic accuracy surrounding extremity fractures. Furthermore, it was discovered that identification of serious occult fractures assisted patient triage. Additionally, this study identified a succinct lack of evidence regarding the management outcomes of patients receiving FAST.	(-) The training and associated competency of clinicians performing prehospital sonography varied throughout studies utilised in this review indicating potential inconsistency of data. This issue is particularly important as FAST is a clinician-dependant imaging modality. Furthermore, as recognised by the authors, some studies utilised had systemic methodological issues and selection bias was likely present, further corrupting used data sets. (+) This review utilised numerous prehospital studies and, resultantly, reviewed data from a large and homogeneous sample size. Additionally, the homogeneous nature of included studies made comparison easy and the identified results

					reliable. This review also presented the most contemporary evidence regarding prehospital ultrasound diagnostic accuracy. Additionally, through extensive analysis of available literature, this review identified relevant gaps in knowledge needing to be addressed.
Jørgensen, Jensen, and Dirks, 2010	From 23 studies, 885 adult/paediatric patients were included. These patients had been involved in disparate traumatic injuries across various urban and rural settings.	Systematic review LOE=1	Outcomes measured included whether prehospital ultrasound was feasible and whether its use affected conveyance time, altered the selected receiving facility, impacted diagnosis, changed patient management, and if this modality increased patient survival.	Found research regarding prehospital ultrasound does not adequately indicate whether this diagnostic tool impacts patient mortality/morbidity. Furthermore, this study was unable to conclude whether this procedure improved patient treatment. It found, however, prehospital ultrasound, by facilitating accurate visitation and diagnosis, altered prehospital patient management. Overall, demonstrated that prehospital ultrasound benefited trauma patients.	(-) Included studies within this review, in regard to blinding and randomisation, demonstrated sub-optimal methodological rigour. Some studies included also had a small sample size and were classed as low-quality medical evidence. Included studies also demonstrated a great heterogeneity between them, rendering data pooling meaningless and direct comparison of included studies unreasonable. (+) This study included a detailed explanation of the exclusion process employed demonstrating its proper and robust nature. Additionally, this study appropriately appraised the available literature

					and also identified gaps in current research needing to be addressed.
O'Dochartaigh and Douma, 2015	925 adult/paediatric patients, from a total of eight studies, were included. These patients had been exposed to disparate traumatic injuries in rural or urban settings.	Systematic review LOE=1	Primary outcome measured was whether FAST of the thoracoabdominal region altered aspects of patient management. Secondary outcome was to identify any associated complications with prehospital FAST.	Found prehospital FAST of the thoracoabdominal region positively changed patient management by informing diagnosis and correct course of treatment. Additionally, FAST improved patient triage and guided decisions regarding which definitive care facility the patient should be conveyed to. Insufficient evidence, however, exists that prehospital FAST affects patient mortality when utilised as a diagnostic technique in this context.	(-) The pooled sample size from included studies was relatively small and majority of included studies were assessed/recognised to be of low quality as they contained tangible risk of bias. Moreover, some pooled data was from heterogeneous studies. Furthermore, the training, qualifications, and level of experience held by various clinicians performing FAST was highly disparate. (+) This study extensively synthesised the information present within available research and discussed the pronounced gaps within contemporary research. Additionally, utilising PRISMA guidelines, this study developed a search protocol which was formally registered before beginning the database searches.

Table 1 Abbreviations: FAST, focused assessment with sonography for trauma; LOE, level of evidence; PRISMA, preferred reporting items for systematic reviews and meta-analyses.

Conclusions/Considerations for Practice

Comments.

There is a succinct paucity of evidence indicating that the utilisation of prehospital FAST carries any impact on the health outcomes of trauma patients.

In order to adequately assess the effect prehospital FAST has on health outcomes, trauma patients would need to be prospectively randomised in settings where FAST was utilised in current practice. This is, however, ethically questionable and, without the use of control groups, the impact prehospital FAST has on health outcomes cannot be established.

To establish a plausible link between prehospital FAST and health outcomes, a high-quality randomised control trial, preferably one across multiple centres, would need to be conducted. If this study was unable to be approved, cluster-randomised studies of ambulance services not yet employing FAST could be proposed.

Should clinical practice be altered?

Clinical practice should remain unchanged as FAST is an effective diagnostic tool guiding initial treatment and triage. While evidence regarding this medical procedure may be unavailable regarding health outcomes, as demonstrated in the clinical scenario, FAST enables acute complications of traumatic injury to be expeditiously identified, appropriately intervened against, and conveyance to the appropriate definitive care facility prioritised. The early identification of free fluid within the intraperitoneal space, or other occult injury secondary to blunt or penetrating trauma to the abdomen, thorax, or pelvis is essential in advancing prehospital care.

Clinical bottom line.

The prehospital imaging modality FAST is an essential diagnostic tool in the evaluation and diagnosis of traumatic injury. Pathology revealed from FAST guides the triage of patients to appropriate definitive care facilities and their management in-between.

These clinical applications of FAST carry the propensity to improve the health outcomes of critical trauma patients. No contemporary prehospital study, however, has investigated whether FAST improves health outcomes in this context.

Research will need to be conducted in order to establish a direct correlation between prehospital FAST and the health outcomes of trauma patients receiving this medical procedure. As a result, therefore, in the context of evidence-based practice, to recommend FAST solely on the clinical impact it has on health outcomes would be inappropriate.

References

- Bøtker, M. T., Jacobsen, L., Rudolph, S. S., & Knudsen, L. (2018). The role of point of care ultrasound in prehospital critical care: a systematic review. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 26. <https://doi.org/10.1186/s13049-018-0518-x>
- Champagne, N., Eadie, L., Regan, L., & Wilson, P. (2019). The effectiveness of ultrasound in the detection of fractures in adults with suspected upper or lower limb injury: a systematic review and subgroup meta-analysis. *BMC Emergency Medicine*, 19. [doi:10.1186/s12873-019-0226-5](https://doi.org/10.1186/s12873-019-0226-5)

Jørgensen, H., Jensen, C., & Dirks, J. (2010). Does prehospital ultrasound improve treatment of the trauma patient? A systematic review. *European Journal of Emergency Medicine, 17*, 249-253. doi:10.1097/MEJ.0b013e328336adce

O'Dochartaigh, D., & Douma, M. (2015). Prehospital ultrasound of the abdomen and thorax changes trauma patient management: A systematic review. *Injury, 46*, 2093-2102. doi:10.1016/j.injury.2015.07.007

Appendix

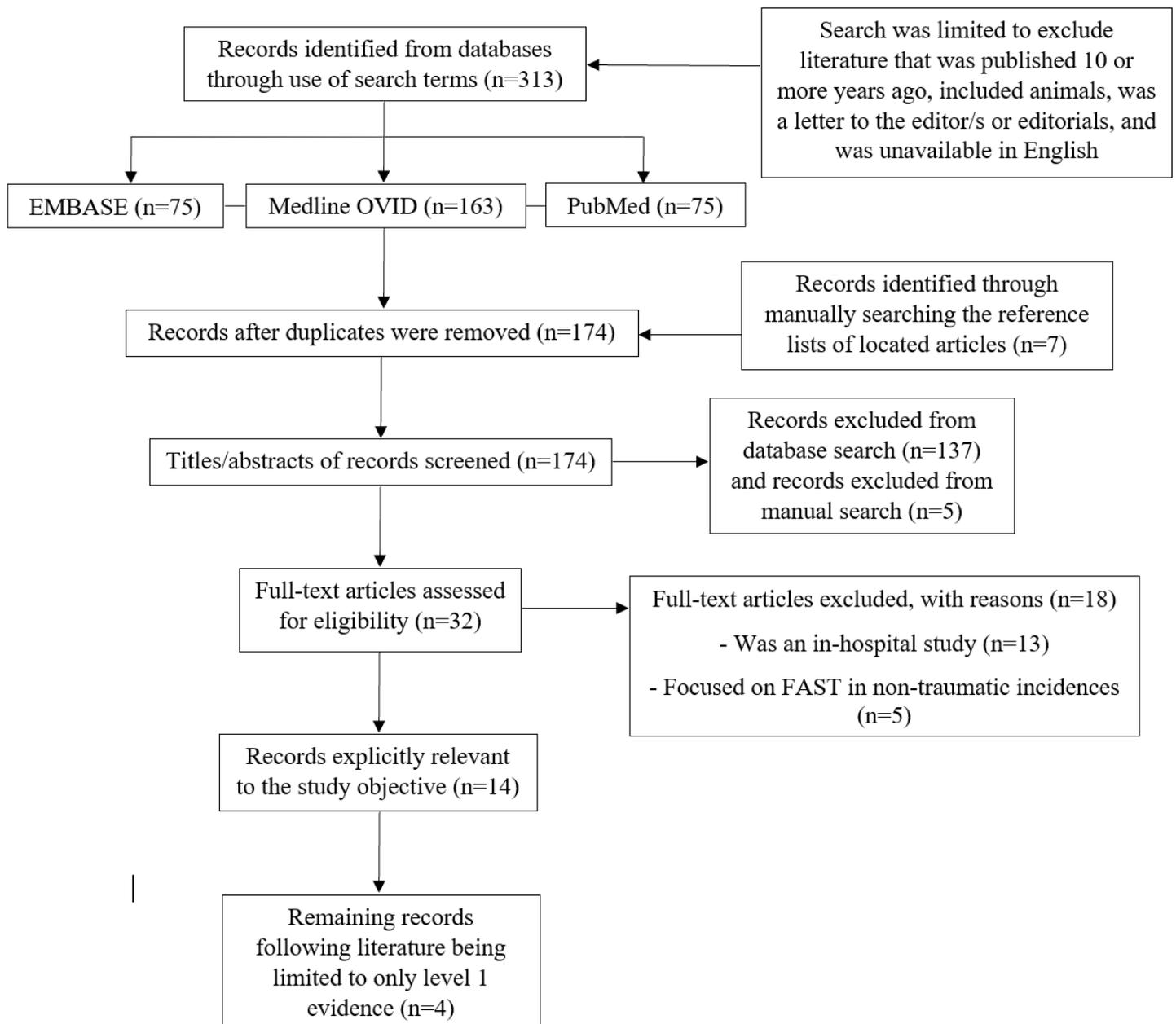


Figure 1: PRISMA Flowchart showing the exclusion process used to identify literature.