Survival after emergency department thoracotomy: review of published data from the past 25 years

Authors' objectives
To determine the main factors that most influence survival after emergency department thoracotomy.

Searching
MEDLINE was searched over a period of 25 years using the keywords 'thoracotomy', 'emergency', 'trauma', 'resuscitation', 'penetrating', 'cardiac' and 'humans'. The dates over which the search was conducted were unclear. The bibliographies of identified publications were cross-checked for additional studies. It was not stated whether any language restrictions were applied.

Study selection
Study designs of evaluations included in the review
The review appears to report data from case series.

Specific interventions included in the review
Thoracotomy conducted in an emergency setting.

Participants included in the review
Patients who underwent a thoracotomy for a blunt or penetrating chest injury in an emergency department, or resuscitation room, shortly after presentation.

Outcomes assessed in the review
The outcome assessed in the reported studies was survival. However, the definition of the outcome was variable across studies.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

The data were extracted for the following categories:

the survival to discharge rate;

the mechanism of injury, i.e. blunt injury, penetrating gunshot wound, or penetrating stabbing wound;

the location of major injury, i.e. cardiac, thoracic, abdominal or multiple injuries; and

the presence of signs of life. The latter was defined as the presence of cardiac electrical activity, respiratory effort or pupillary response, and was categorised as either present in the hospital, in transport, or in the field.
In addition, the location of the series, the period of time studied, the total number of emergency thoracotomies performed, and the neurological capacity of the survivors, were also recorded.

**Methods of synthesis**

How were the studies combined?
The overall mean survival rate was obtained by dividing the total number of surviving patients in each category by the total number of emergency thoracotomies performed within that category.

How were differences between studies investigated?
The level of heterogeneity between the patient populations was not assessed either within or between the reviewed studies. However, the results were grouped according to mechanism and type of injury.

**Results of the review**

Twenty-four studies involving a total of 4,620 patients were incorporated in the review.

Survival rates were reported from 15 studies (n=984) investigating stab wounds, 15 studies (n=1,712) investigating gunshot wounds, and 18 studies (n=3,173) investigating blunt trauma-related injuries.

Survival rates were also reported from 19 studies (n=1,058) on patients with cardiac injury, 14 studies (n=1,493) on patients with thoracic injury, 11 studies (n=640) on patients with abdominal injuries, and 5 studies (n=590) on patients with multiple injuries.

The overall survival rate for the 4,620 included patients was 7.4% (range: 1.8 to 27.5).

The survival rates varied with the mechanism of injury. Of those patients with injuries caused by blunt trauma, the survival rate was 1.4% (range: 0 to 12.5). The survival rate for penetrating injuries was 8.8% (range: 2.7 to 38.9). However, among the latter category, the rates for survival varied from 4.3% (range: 0 to 16.7) for gunshot victims to 16.8% (range: 8.3 to 72.2) for those with stab wounds.

A survival rate of 19.4% was reported for patients with predominantly cardiac injuries. The corresponding rates were 10.7% for all thoracic injuries, 4.5% for abdominal injuries and 0.7% for patients with multiple locations of injury.

Patients showing signs of life in the hospital had a survival rate of 11.5%, compared with 8.9% of those showing signs of life during transport and only 1.2% of those showing no signs in the field.

Of those who survived their traumatic injury, 92.4% of the patients retained neurological functioning that was sufficient to resume the normal activities of daily living.

**Authors’ conclusions**

The best results were observed in patients undergoing emergency department thoracotomy for thoracic stab injuries, who arrived in the emergency department showing signs of life. The mechanism of injury, the location of the principal injury, and the presence or absence of signs of life should all be considered when deciding whether to perform an emergency thoracotomy.

**CRD commentary**

While the intervention of interest and the population studied were clearly defined in the report, the types of studies considered were unclear. From the report it appears that included studies were case series. This can lead to problems with data interpretation, with variation in the population, and of bias owing to case selection, thus making the validity of the review questionable.

The authors searched MEDLINE over a 25-year period and checked follow-up references. They did not, however, report any attempt to locate unpublished literature. A more expansive search strategy may have retrieved additional
studies. As the review stands, its generalisability beyond the USA is questionable.

The authors did not assess the validity of the included studies; this could be problematic owing to their possible variability.

Notwithstanding these limitations, the data from the included studies was reported appropriately. No form of weighting was used in pooling the studies, and heterogeneity was not assessed. The authors highlighted one problem: variability in the definition and subsequent reporting of survival outcomes. This may render the data heterogeneous.

**Implications of the review for practice and research**

**Practice:** The authors state that in view of the low survival rates (in particular, for those patients who have suffered multiple trauma or show no signs of life in the field) and the high costs of the procedure (including the loss of the patient's dignity, risk to care providers during the procedure, and the use of valuable health care resources), the continued use of emergency department thoracotomy must be critically examined by practitioners.

**Research:** The authors state that uniform reporting guidelines are required to further elucidate the role of emergency department thoracotomy.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.