Impact of interhospital transfer on outcomes for trauma patients: a systematic review
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CRD summary
This review assessed the association between transfer status (direct admission or interhospital transfer) and outcomes in patients with trauma. Statistical analysis showed no difference in mortality. The authors concluded that significant variation across the included observational studies precluded any definitive conclusions. This cautious conclusion seems reliable.

Authors' objectives
To assess the association between transfer status (direct admission or interhospital transfer) and outcomes in patients with trauma.

Searching
MEDLINE and EMBASE were searched from inception to June 2011. A search strategy was presented. The reference lists of relevant studies and reviews were scanned to identify further articles.

Study selection
Eligible for inclusion were randomised controlled trials, controlled before and after studies, interrupted time series, case control and cohort studies that compared the impact of transfer status on outcomes in patients with trauma. Transfer status was defined as direct admission to a hospital for definitive care, or admission by transfer from another hospital after stabilisation and/or initial treatment. The outcomes of interest were mortality, hospital or intensive care unit length of stay, complications, time to first hospital or time to definitive care. Studies with more than 80% patients with burns were excluded, as were those where transfer status was not the primary exposure of interest.

Most included studies were conducted in urban or mixed urban/non urban settings. Patients had predominantly moderate to major trauma (according to the Injury Severity Score) such as brain/head injuries, blunt or penetrating trauma, orthopedic or blunt pancreatic injury and other traumas. The primary mortality outcome in most studies was in-hospital mortality.

After initial screening had taken place, two reviewers independently selected studies for inclusion. Disagreements were resolved by consensus between three reviewers.

Assessment of study quality
The methodological quality of included studies was assessed on the following: comparability of study groups; method of participant selection; ascertainment of transfer status and outcome variables; follow-up; analysis; and control for confounding variables. Studies were classified as low, medium or high risk of bias. Authors were contacted for further detail, where necessary.

Two reviewers independently carried out the quality assessment.

Data extraction
Data were extracted to enable the calculation of odds ratios (OR) and 95% confidence intervals (CI). Authors were contacted for further detail, where necessary.

Two reviewers extracted the data. Disagreements were resolved by consensus with a third reviewer.

Methods of synthesis
The main synthesis was narrative. For hospital mortality, odds ratios were pooled in a random-effects meta-analysis. Statistical heterogeneity was assessed using $I^2$ (where $I^2$ greater than 50% was considered high heterogeneity). Separate analyses were conducted to include potential transfers (patients who died before being transferred) and for studies of patients from rural areas.
Results of the review

Thirty-six observational studies (prospective and retrospective cohort designs) were included in the review. Sample sizes ranged from 39 to 10,950 patients. It was not possible to determine how many patients were included in each study group. Methodological quality was variable; all studies were classified as either medium or high risk of bias. The main concerns were in relation to comparability of groups and control for confounding.

Pooled analysis showed no statistically significant differences between transfer status groups for in-hospital and 30-day mortality (OR 1.04, 95% CI 0.88 to 1.22; 34 studies; I² = 82%). The absence of statistical significance remained when potential transfers were included (OR 1.09, 95% CI 0.93 to 1.29; 34 studies; I² = 83%) and when studies with patients from rural areas were analysed separately (OR 0.94, 95% CI 0.77 to 1.14; eight studies; I² = 12%).

There was no evidence of differences between transfer status on hospital and intensive care unit length of stay (19 studies). Time from injury to definitive care was longer for transfer patients (14 studies). Complications were higher in transfer patients than those directly admitted to care (two studies).

Cost information

Costs were marginally higher for transferred patients compared to those directly-admitted (relative increase, 1.09, 95% CI 1.08 to 1.09).

Authors' conclusions

There was no difference in mortality between patients transferred and those directly admitted to hospital care. Significant heterogeneity across the included studies meant that definitive conclusions could not be derived from the evidence presented.

CRD commentary

The review question was clear, and inclusion criteria were sufficiently detailed to enable replication. Two relevant data sources were searched. The review did not include unpublished data, which meant that relevant studies might have been missed and publication bias was a possibility. The review process was carried out with some attempts to minimise error and bias, but it appeared that independent selection of studies occurred only after initial screening had taken place. Appropriate quality assessment criteria were applied and the results of this were presented and discussed. Study details were presented for all except one study.

Statistical heterogeneity was high, and subgroup analysis suggested that this variation occurred within studies in urban or mixed urban/non urban settings. Slight discrepancies were noted in the reporting of results between forest plots and text. The authors’ cautious conclusion reflects the evidence presented and seems reliable.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that in the absence of an experimental study, a methodologically-robust observational study was required to collect patient data from the injury scene to the trauma centre (to control for potential confounding). The sample size should be large enough to permit subgroup analysis across rural and urban populations.

Funding

Canadian Institute for Health Research; Ontario Ministry of Health and Long-term Care Clinician Scientist Award; Heart and Stroke Foundation Phase II Clinician Scientist Award; Canada Research Chair in System of Trauma Care.

Bibliographic details


PubMedID

22182900

DOI
10.1097/TA.0b013e31823ac642

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Female; Follow-Up Studies; Hospital Mortality /trends; Humans; Injury Severity Score; Male; Ontario; Patient Transfer /organization & administration; Program Evaluation; Risk Assessment; Survival Analysis; Trauma Centers; Treatment Outcome; Wounds and Injuries /diagnosis /mortality /therapy

AccessionNumber
12012000890

Date bibliographic record published
08/03/2012

Date abstract record published
05/07/2012

Record Status
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.