Prehospital triage and direct transport of patients with ST-elevation myocardial infarction to primary percutaneous coronary intervention centres: a systematic review and meta-analysis

Brooks SC, Allan KS, Welsford M, Verbeek PR, Arntz HR, Morrison LJ

CRD summary
This well-conducted review found insufficient evidence to support the superior effectiveness of direct transport of patients with ST-elevation myocardial infarction to a centre with facilities for primary percutaneous coronary intervention compared with transport to the nearest hospital. The authors' conclusions reflected the evidence presented and are likely to be reliable.

Authors' objectives
To determine whether direct transport of patients with ST-elevation myocardial infarction (STEMI) to primary percutaneous coronary intervention centres reduced short-term mortality compared with transportation to the nearest hospital.

Searching
MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials (CENTRAL), Web of Science, CINAHL, HealthSTAR, ProQuest Digital Dissertations, the NIH CRISP (Computer Retrieval of Information on Scientific Projects) and ClinicalTrials.gov were searched from 1980 to July 2007. A modified version of the Cochrane Pre-hospital and Emergency Health Field search strategy was used; search terms were reported. No language restrictions were applied. Studies published in abstract form only were excluded. References of included studies were also searched. Attempts were made to contact principal authors for information about relevant studies.

Study selection
Randomised and quasi-randomised controlled trials, before-after studies, and controlled cohort studies were eligible for the review. Eligible studies had to involve adults diagnosed with acute ST-elevation myocardial infarction (STEMI) who had experienced chest pain for less than 12 hours and were identified by emergency medical services staff outside hospital. Studies had to compare direct transport to an interventional centre for primary percutaneous coronary intervention with transport to the nearest available emergency department, with or without administration of a fibrinolytic drug. STEMI had to be diagnosed using 12-lead pre-hospital electrocardiography.

Studies had to report at least one outcome related to mortality, treatment time intervals, reinfarction, stroke or cardiogenic shock. The pre-specified primary outcome was 30-day all-cause mortality. Because of the limited evidence found, a post-hoc combination of in-hospital and 30-day mortality (short-term mortality) was used as the primary outcome.

Participants in included studies were mainly male, with a mean or median age in the 60s. Emergency medicine personnel were ambulance medical doctors or paramedics (where reported).

Study selection involved two independent reviewers who were blinded to author, institutional affiliation, journal and year of publication; disagreements were resolved by consensus.

Assessment of study quality
Study quality was assessed independently by two reviewers (blinded as for inclusion assessment) using a modified version of the Thomas Quality Assessment Tool for Quantitative Studies. Studies were assessed as strong, moderate or weak for selection bias, allocation bias, baseline confounders, blinding and follow-up rate. Disagreements were resolved by consensus.

Data extraction
Two reviewers (blinded as for inclusion assessment) independently extracted data to calculate relative risks (RRs) and
95% confidence intervals (CIs) for dichotomous outcomes. Medians and interquartile ranges for each intervention (where reported) were extracted for time interval outcomes. Disagreements were resolved by consensus.

**Methods of synthesis**

Pooled relative risks were calculated by meta-analysis using random-effects models where data allowed. Heterogeneity was assessed using the $\chi^2$ test and I$^2$ statistic. Studies were not pooled if I$^2$ was more than 50%.

A post-hoc subgroup analysis was performed to explore the effect of pre-hospital fibrinolysis in the control group on treatment effect.

**Results of the review**

Five studies were included in the review: two were randomised trials (n=364 patients) and three were prospective observational studies (n=616 patients).

Meta-analysis (based on four studies) showed no significant difference between groups in short-term mortality (RR for transport to percutaneous coronary intervention centre 0.51, 95% CI 0.24 to 1.10; I$^2$=0%).

The subgroup analysis suggested that transport to a percutaneous coronary intervention centre was significantly superior to transport to the nearest hospital when pre-hospital fibrinolysis was not used in the latter group (RR 0.24, 95% CI 0.07 to 0.87; two studies).

Results for other outcomes were reported for single studies.

**Authors' conclusions**

There was insufficient evidence to support the superior effectiveness of direct transport of patients with ST-elevation myocardial infarction to a percutaneous coronary intervention centre compared with transport to the nearest hospital.

**CRD commentary**

The review question and inclusion criteria were clear. The search covered a range of relevant sources without language restrictions. The review was restricted to published studies, so there may have been a risk of publication bias. Study selection, validity assessment and data extraction were conducted in duplicate by blinded reviewers, minimising risk of reviewer errors or bias.

Study quality was assessed using relevant criteria; limitations of the included studies were discussed in the text. Relevant details of included studies were presented. Studies were pooled by meta-analysis where sufficient data were available; a lack of statistical heterogeneity suggested that meta-analysis was appropriate. This was a generally well-conducted review.

The authors’ conclusions reflected the evidence presented and are likely to be reliable.

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

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

**Research:** The authors stated that future research should focus on comparing direct transport for percutaneous coronary intervention with pre-hospital thrombolysis.

**Funding**

Not stated.

**Bibliographic details**

Brooks SC, Allan KS, Welsford M, Verbeek PR, Arntz HR, Morrison LJ. Prehospital triage and direct transport of patients with ST-elevation myocardial infarction to primary percutaneous coronary intervention centres: a systematic
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.