Advanced life support versus basic life support in the pre-hospital setting: a meta-analysis

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CRD summary
This review concluded that compared to basic life support, advanced life support in the pre-hospital setting can increase the chances of survival for non-traumatic cardiac arrest patients. Advanced life support for trauma patients was not associated with increased survival. The conclusions should be interpreted with caution due to concerns about study quality, the review reporting and heterogeneity.

Authors' objectives
To assess whether advanced life support increased patient survival in pre-hospital treatment compared to basic life support and if so, for which patient groups.

Searching
MEDLINE, EMBASE, The Cochrane Library and Scopus were searched up to July 2010. Search terms were reported. The database search was limited to studies in English. Conference abstracts were searched and references of identified studies checked. Clinical experts were consulted to identify any additional published studies. A general Internet search was carried to identify grey literature.

Study selection
Randomised controlled trials (RCT), quasi-randomised trials and before-and-after prospective studies that compared advanced life support to basic life support in patients in the pre-hospital setting were eligible for inclusion. The pre-specified primary outcome was survival at hospital discharge. Secondary outcome was survival at hospital admission. Half of the studies assessed trauma patients and half assessed non-trauma cardiac patients.

Two reviewers independently screened studies for inclusion. Disagreements were resolved by a third reviewer.

Assessment of study quality
Sequence generation, allocation concealment, blinding of participants, personnel and outcome assessors, incomplete outcome data, selective outcome reporting and baseline imbalance were assessed. Other sources of reporting bias were evaluated based on the recommendations of the Cochrane Collaboration.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Outcomes were extracted from each study to calculate odds ratios (ORs) and 95% confidence intervals (CIs). Missing information were sought through contact with study authors.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Studies were pooled using both fixed-effect and random-effects models. Heterogeneity was assessed with $X^2$ and $I^2$. The number needed to treat was derived from the meta-analyses. Sources of heterogeneity were assessed with meta-regression and subgroup analyses. It was unclear whether these analyses were prespecified. An ad hoc sensitivity analysis was performed to assess the effect of a large study on pooled estimates. Funnel plot asymmetry was tested for continuous and dichotomous outcomes with Egger's and Rucker's arcsine tests to assess potential publication bias.

Results of the review
Eighteen studies were included in the review. Nine studies included 16,857 trauma patients and nine included 7,659 patients with cardiac arrest. Most of the studies were before-and-after designs or quasi-randomised trials (exact number not reported).

Sequence generation and allocation concealment of the included studies provided the largest risk of bias. Risk of bias
associated with blinding of participants, personnel and outcomes was most often uncertain. Other sources of bias were considered low risk.

**Trauma victims:** Meta-analysis suggested that advanced life support care in trauma patients reduced the probability of survival at hospital discharge by 34% compared to basic life support care (OR 0.659, 95% CI 0.594 to 0.732; nine studies). Sensitivity analysis that excluded the largest trial (9,405 patients) produced a non-significant pooled relative effect of advanced life support (OR 0.892, 95% CI 0.775 to 1.026; eight studies).

**Non trauma cardiac-arrest patients:** Pooled analysis suggested that advanced life support care in non trauma cardiac arrest patients increased the odds of survival at hospital discharge by nearly 47% compared to basic life support care (OR 1.468, 95% CI 1.257 to 1.715; nine studies). Subgroup analyses suggested that advanced life support provided by physicians significantly increased the probability of survival at hospital discharge compared to basic life support (OR 2.047, 95% CI 1.593 to 2.631; six studies).

A sub-analysis of studies where survival data of patients at hospital admission were available suggested that advanced life support improved the probability of survival at hospital admission compared to basic life support (OR 1.733, 95% CI 1.537 to 1.954; four studies).

Number needed to treat calculations and X² and I² details were not reported.

**Authors’ conclusions**
Compared to basic life support, advanced life support in the pre-hospital setting can increase the probability of survival for non-traumatic cardiac arrest patients. However, advanced life support care for trauma patients was not associated with increased survival. There were few controlled studies of sufficient quality examined survival in trauma patients.

**CRD commentary**
The review question and inclusion criteria were clear. The literature search was thorough, although studies may have been missed due to language restrictions. Study selection was carried out with appropriate attempts to minimise error and bias; it was unclear whether similar attempts were made during data extraction and quality assessment.

Separate pooling of trauma and non-trauma patients was appropriate. The number and types of subgroup analyses were unknown and the results of several subgroup analyses were not shown, which suggested a risk of reporting bias. X² and I² results were not reported despite forest plots that suggested between-study heterogeneity. The sources and degree of heterogeneity remained partly unclear, which may limit the generalisability of the review findings. There were concerns about the reliability of the evidence base due to the limited number of high quality studies.

The conclusions of the review should be interpreted with caution due to limitations in the quality of the evidence base and in the reporting of the review and concerns about between-study heterogeneity.

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

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

**Research:** The authors suggested that further research was needed to evaluate pre-hospital basic life support and advanced life support, taking into account the type and severity of the trauma as well as the setting at the individual hospital and health system levels. The authors suggested that this would help identify which patient groups would benefit from advanced life support or basic life support.

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