Cost-effectiveness analysis of helicopter EMS for trauma patients

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Helicopter emergency medical services (EMS) for trauma patients.

Type of intervention
Emergency treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Trauma patients.

Setting
University hospital, Pennsylvania, USA.

Dates to which data relate
The study used resource use data (from 1994-1995) obtained from a hospital-based air medical program serving a rural suburban area (population approximately 2 million). Effectiveness data were derived from studies published and conducted between 1983 and 1995. The price year was the fiscal year 1994-1995.

Source of effectiveness data
Effectiveness data were taken from a review of previously completed studies.

Outcomes assessed in the review
The number of expected deaths (calculated using the TRISS methodology, which combines the Trauma Score, the Injury Severity Score and the patient’s age to predict survival) and number of observed deaths were assessed and combined using a formula in order to obtain the survival benefit expressed as the number of lives saved per 100 transports.

Study designs and other criteria for inclusion in the review
A MEDLINE search for the period 1983-1995 was performed. The findings were supplemented with a manual literature search. Three criteria were used for study selection: (1) English-language articles, (2) articles detailing the evaluation of helicopter transport of trauma patients and (3) articles detailing the evaluation of survival benefits using the TRISS method described by Champion et al. The study designs included were not clearly stated (although it is likely that the majority were case series studies).
Sources searched to identify primary studies
A MEDLINE search and a manual literature search were performed.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
The methods used to judge relevance and validity were not stated, while the summary statistics from the original studies were extracted.

Number of primary studies included
10 studies, representing 12 data sets met the selection criteria. The 13th data set was formed from the trauma register at the authors’ institution (case series).

Methods of combining primary studies
The results of the 13 data sets were combined in order to arrive at an overall estimate of the survival benefit, using a full-bayesian random-effects model in which the 13 data sets represented random effects.

Investigation of differences between primary studies
Different populations of trauma patients were investigated respectively in the primary studies.

Results of the review
The reported literature survival benefit ranged from 1.1 to 12.1 additional survivors per 100 patients flown. The combined estimate was 4.9 (95% CI:1.9-7.5).

Measure of benefits used in the economic analysis
The measure of benefits were life-years gained and deaths avoided. The life-years gained (discounted) were estimated using assumptions of average life expectancy based on the average age of trauma survivors at the authors’ institution (31 years).

Direct costs
Direct operating programme costs (personnel, operations, medical supplies, insurance, administration) as reported by the university hospital finance department for two fiscal years (1993-1994 and 1994-1995) were considered. Estimated hospital costs for each of the unexpected trauma survivors (found in the effectiveness study) were added to these direct costs. The price year was 1995.

Currency
US dollars ($).

Sensitivity analysis
One way sensitivity analyses were performed using the cost per transport, hospital cost of unexpected survivors, number of additional survivors and their life expectancy. Two way sensitivity analyses using transport cost and number of unexpected survivors were also conducted.
Estimated benefits used in the economic analysis
5 additional survivors per 100 patients flown were associated with the intervention. The life years gained with the intervention were therefore 225 years for an average patient age of 31 years.

Cost results
Transport costs were $2,214 per patient and each additional survivor's hospitalisation averaged $15,883.

Synthesis of costs and benefits
For the base case (5 additional survivors per 100 patients flown), the cost per life was $60,163 and the discounted cost (3% annual rate) per year of life was $2,454 (for a cohort of patients with an average age of 31 years). Sensitivity analysis revealed that discounted cost per year of life saved could be as high as $9,677 or as low as $1,400 and that it was most dependent on the survival benefit. These results are comparable to a reported median discounted cost per year of life of $19,000 for other commonly used life-saving medical interventions.

Authors' conclusions
Assuming that helicopter air medical transport provides a substantial survival benefit for trauma patients, the findings suggest that this service is a cost-effective option. The magnitude of the survival benefit is the most important factor determining cost-effectiveness.

CRD COMMENTARY - Selection of comparators
It could be said that the comparator used in this study was the 'do nothing' alternative, however, the authors did compare their results with other emergency medical operations and these could also be considered as comparators.

Validity of estimate of measure of benefit
Data do not appear to have been used selectively to prove a particular point and the choice of health outcomes was justified. However the estimate of effectiveness was derived from uncontrolled studies differing from the populations at hand, and thus the validity of the result is questionable.

Validity of estimate of costs
Details of the cost estimation were given. Comparisons were made with other commonly used emergency medical interventions.

Other issues
Cost results may not be generalisable to other settings or countries.

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