The cost-effectiveness of thrombolysis administered by paramedics
Scuffham PA, Tippett V

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.

CRD summary
The objective was to conduct a cost-effectiveness analysis of pre-hospital paramedic-administered thrombolysis in patients with ST segment elevation myocardial infarction compared with the current practice of administering thrombolysis in the hospital. The authors concluded that paramedic administration could avert some deaths and was good value for money. On the whole, the methodology was appropriate and was clearly and transparently reported. The conclusions reached by the authors appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim was to conduct a cost-effectiveness analysis of pre-hospital paramedic-administered thrombolysis in patients with ST segment elevation myocardial infarction (STEMI) compared with the current practice of administering thrombolysis in the hospital.

Interventions
Tenecteplase was the thrombolytic drug used as paramedics had recently implemented its use in the authors’ setting.

Location/setting
Australia/pre-hospital care and hospital.

Methods
Analytical approach:
A first-order, Monte Carlo, micro-simulation model, with a range of time horizons that extended to lifetime, was used. It modelled an initial acute phase of 30 days, and the subsequent long-term phase up to lifetime. The authors reported that the perspective was the direct health care costs incurred by the Government.

Effectiveness data:
The time until administration (time-to-needle) and the reduction in this due to paramedic administration came from local ambulance service data. The effectiveness data came mainly from a previous health technology assessment. This was supplemented with a brief review of the literature for the relationship between the differential timing of thrombolysis and death or heart failure (including stroke, bleeding, and anaphylaxis). The methods of the search were not reported. Weighted least squares regression was used to synthesise the relationship between time-to-needle and mortality or heart failure data.

Monetary benefit and utility valuations:
The utility weights were referenced and justified, except for the state of healthy after myocardial infarction. The utility weight for heart failure came from a study that used the time trade-off method, and that of stroke was the median from a quality-of-life review.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and the long-term benefits were discounted at a rate of 5% per annum.

Cost data:
The currency was Australian dollars (AUD) and price year was 2004. Hospital costs were from Australian diagnosis-related group data. To avoid double counting of the adverse events from the initial myocardial infarction, only marginal costs of these were included. The paramedic costs were assumed. The chronic costs included prescriptions, general practitioner visits, and stroke-related costs. Discounting of long-term benefits was performed at 5% per annum.

Analysis of uncertainty:
One-way sensitivity analyses were conducted.

Results
Over a lifetime, the current strategy was associated with 6.510 QALYs and paramedic thrombolysis produced 6.642 QALYs. The costs were AUD 35,085 with the current strategy and AUD 35,429 with paramedic thrombolysis. The incremental cost-effectiveness ratio (ICER) for paramedic treatment was AUD 2,601 per QALY.

At 10 years, the ICER was AUD 2,262 and, at one year, it was AUD 5,579. A secondary analysis with life-years as the benefit measure produced similar results.

An ICER scattergraph with a 95% confidence ellipse was reported for the lifetime analysis. One-way sensitivity analysis confirmed that these results were robust and within commonly used cost-effectiveness thresholds. The most influential parameter was the QALY weight for good health after myocardial infarction, followed by discount rates, and costs of therapy and medication. The time-to-needle had almost no effect on the ICER, but had large proportional effects on both the costs and QALYs. Different age subgroups had similar ICERs.

Authors' conclusions
The authors concluded that pre-hospital thrombolysis administered by paramedics could avert some STEMI deaths and was good value for money.

CRD commentary
Interventions:
The comparators appeared to be relevant to the objective and their selection was justified. The authors chose tenecteplase due to its local availability, but the dosage was not described. They acknowledged that they omitted a potential comparator, which was primary percutaneous coronary intervention.

Effectiveness/benefits:
The effectiveness derivation was described and the assumptions were reported. Some of the effectiveness data were based on tissue-plasminogen activator trial data and meta-analysis, and it was not clear if the authors assumed equivalence or a class effect. The sources were described and the search strategy was reported broadly, but not in detail.

Costs:
The cost analysis appears to have been appropriate and all those costs relevant to the perspective seem to have been included. The only exception was the initial costs of the paramedics that provided the pre-hospital thrombolysis. These initial training and set-up costs may have been significant and the authors chose to exclude them because they occurred early on and were not relevant afterwards.

Analysis and results:
The authors performed an appropriate data synthesis and the reporting was clear. The impact of uncertainty was adequately evaluated and issues of generalisability were addressed.

Concluding remarks:
On the whole, the methodology was appropriate and was clearly and transparently reported. The conclusions reached by the authors appear to be appropriate.
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