Cost-effectiveness analysis of mechanical thrombectomy in acute ischemic stroke

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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.

CRD summary
The objective was to examine the cost-effectiveness of mechanical thrombectomy in comparison with standard medical therapy for the treatment of large-vessel ischaemic stroke in patients who were not eligible to receive tissue plasminogen activator. The authors concluded that mechanical thrombectomy was cost-effective. The study was based on valid methodology, but was not extensively reported. Further studies are required to corroborate the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to examine the cost-effectiveness of mechanical thrombectomy in comparison with standard medical therapy for the treatment of large-vessel ischaemic stroke in patients who were not eligible to receive tissue plasminogen activator.

Interventions
The two treatments for patients with acute stroke were available for those able to receive treatment within eight hours of symptom onset. The intervention was mechanical thrombectomy with the Merci mechanical clot retrieval system. The comparator was standard medical therapy based on antiplatelet drugs and supportive care, but no thrombolytics.

Location/setting
USA/hospital.

Methods
Analytical approach:
The economic evaluation was based on a Markov model with a 20-year time horizon. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical data came from a selection of known, relevant studies, including randomised controlled trials (RCTs) and other open-label trials. The efficacy of mechanical thrombectomy was taken from an open-label cohort study without a control arm and the efficacy of medical therapy was obtained from the placebo arm of a RCT. No further details of these studies were given. It appears that each study provided a clinical value and there was no need to combine any clinical estimates. The key clinical endpoint was the probability of surgical removal of the blockage.

Monetary benefit and utility valuations:
The utility values came from a published economic evaluation and its details were not given.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and were discounted at 3% per annum.

Cost data:
The economic analysis included the costs of hospitalisation for acute stroke (in-patient and endovascular procedures costs), rehabilitation after stroke, and long-term care associated with various health conditions. The costs and quantities came from a variety of sources, including Medicare reimbursement rates and published studies. A breakdown of cost
items was not provided. All costs were in US dollars ($) and the price year was 2008. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
A deterministic one-way sensitivity analysis was undertaken on all the model inputs, using published ranges of values. When published evidence was not available, a range of ± 25% was used.

Results
In the base case of a typical 67-year-old patient, the expected costs were $142,000 with standard therapy and $148,600 with mechanical thrombectomy. The QALYs were 1.83 with standard therapy and 2.37 with mechanical thrombectomy. The incremental cost per QALY gained with mechanical thrombectomy over standard care was $12,120.

In all the scenarios considered in the sensitivity analysis, the incremental cost-utility ratio remained below the commonly used threshold of $50,000 per QALY, except when the patient age at stroke treatment was over 82 years.

Authors’ conclusions
The authors concluded that mechanical thrombectomy for the treatment of large-vessel ischaemic stroke was cost-effective. They noted that this conclusion required validation with data from a prospective randomised controlled trial.

CRD commentary
Interventions:
The authors justified their selection of the comparators. The comparator was based on the American Heart Association and the American College of Chest Physicians guidelines for the management of ischaemic stroke. The intervention was based on the Food and Drug Administration’s approval of the mechanical thrombectomy device for the removal of blood clots from cerebral arteries.

Effectiveness/benefits:
Limited information on the sources of clinical inputs was provided. The efficacy of mechanical thrombectomy was taken from an open-label cohort study, because no RCT was found, and the efficacy of medical therapy was taken from the placebo arm of a RCT. More details on, for example, the study samples or follow-ups would have been useful. The authors stated that there were differences in patient populations between the studies and that this was investigated in the sensitivity analysis. QALYs were an appropriate measure of the impact of the interventions on the patients’ health, given the effect of the disease on both mortality and morbidity.

Costs:
The categories of costs and their sources suggested the adoption of a payer’s perspective, although the authors stated that a societal perspective was used. The use of Medicare data limited the transparency of the economic analysis because these are usually presented as macro-categories of costs. When other sources of data were used, no details were given on their methodological features. Other aspects of the analysis such as the price year and the use of discounting were reported.

Analysis and results:
The costs and benefits were appropriately reported and synthesised. The issue of uncertainty was only partially investigated as the authors used a deterministic approach that focused on one input at a time. A more global analysis would have been useful. The authors acknowledged some limitations of their analysis, which mainly related to weaknesses in some clinical sources.

Concluding remarks:
The study was based on valid methodology, but was not extensively reported. Further studies are required to corroborate the authors’ conclusions.

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