Economic impact of using additional diagnostic tests to better select patients with stroke for intravenous thrombolysis in the United Kingdom

Earnshaw SR, McDade C, Chapman AM, Jackson D, Schwamm L

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
This study assessed the cost-effectiveness of adding perfusion computed tomography (CT) or magnetic resonance imaging (MRI) to usual care, for the selection of patients, who had experienced a stroke, for thrombolysis. The authors concluded that adding tests, such as perfusion CT or MRI, might be good value for money, for the UK health system, and improve patient outcomes. There were a few limitations to the study, but the methods appear to have been valid and the conclusions seem appropriate.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of adding perfusion computed tomography (CT) or magnetic resonance imaging (MRI) to usual care, for the selection of patients, who had experienced a stroke, for thrombolysis.

Interventions
Three interventions were compared: usual care, including normal CT; perfusion CT, and MRI with normal CT.

Location/setting
UK/hospital (stroke unit).

Methods
Analytical approach:
A decision model was developed to combine the cost and outcome data. A lifetime horizon was used and the authors reported that the perspective of the UK NHS was adopted.

Effectiveness data:
The effectiveness data were generally from published studies. Death rates were from previous studies, and age and gender-specific life tables. The efficacy of the diagnostic tests was based on the modified Rankin Scale (mRS) score at day 90. The mRS score for usual care was from a published study, and the authors assumed the benefit for perfusion CT.

Monetary benefit and utility valuations:
The utility values were from a published study, which used the EQ-5D to estimate the utilities. The disability status, of the patients in this study, was defined using the Barthel Index, which was mapped to mRS scores.

Measure of benefit:
Life-years and quality-adjusted life-years (QALYs) were the summary measures of benefit. They were discounted at an annual rate of 3.5%.

Cost data:
The economic analysis included hospitalisations, long-term medical care, and diagnostic tests. The cost estimates were from a variety of sources including the Personal Social Services Research Unit and the Office for National Statistics. The resource use was from published sources. The price year was 2009, and the costs were discounted at an annual rate.
of 3.5%. They were reported in UK £.

Analysis of uncertainty:
Monte-Carlo simulation was used to examine the uncertainty in the model outputs, with the results displayed in incremental cost-effectiveness scatter plots. One-way sensitivity analyses were carried out, on various model inputs, with the results presented in a tornado diagram.

Results
The number of life-years gained was 21.93 with usual CT, 21.99 with perfusion CT, and 21.98 with MRI. The number of QALYs gained was 12.82 for usual CT, 12.94 for perfusion CT, and 12.82 for MRI. The total cost was £38,250.63 for usual CT, £38,190.61 for perfusion CT, and £38,240.21 for MRI. MRI dominated usual CT as it was less costly and more effective, while perfusion CT dominated MRI.

The sensitivity analysis showed that perfusion CT had lower costs and greater benefit than usual CT in 69.52% of simulations, while MRI was less costly and more effective than usual CT in 49.89% of simulations.

Authors' conclusions
The authors concluded that adding diagnostic tests, such as perfusion CT or MRI, to select patients for thrombolysis might be good value for money, for the UK health care system, and improve patient outcomes.

CRD commentary
Interventions:
The choice of interventions was appropriate, as they were those recommended for use by the UK Department of Health. It was unclear if there were other relevant interventions that could have been included. The interventions were adequately described.

Effectiveness/benefits:
A systematic review does not appear to have been conducted to identify the sources for the effectiveness data, but these sources seem to have been appropriate. The efficacy of perfusion CT was assumed by the authors, and may be subject to error. QALYs were an appropriate benefit measure capturing the impact of the disease on quality and length of life. Brief details of the utility estimations were provided and they appear to have been appropriate. The reference was given and could be consulted to fully assess these estimations.

Costs:
Those costs relevant to the stated perspective were included. Some of the cost estimates were reported as category totals, rather than unit costs, reducing the transparency of the analysis. The cost estimates were varied in the sensitivity analysis. The costs were appropriately discounted and adjusted for inflation.

Analysis and results:
The decision model was appropriate for combining the cost and effectiveness data. This model was described and a diagram was given. The results of the analysis were clearly presented, and the most cost-effective diagnostic strategy was identified. Valid approaches were used to investigate uncertainty. The results should be generalisable to similar settings. The authors discussed some limitations of their analysis, which mainly related to the lack of data for some model inputs.

Concluding remarks:
There were a few limitations to the study, but the methods appear to have been valid and the conclusions seem appropriate.

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