Cost-effectiveness of treatment of unruptured intracranial aneurysms in patients with a history of subarachnoid hemorrhage

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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 assess the cost-effectiveness of surgery and endovascular treatment for unruptured intracranial aneurysms in patients with a history of subarachnoid haemorrhage. For 50-year-olds, the treatment of aneurysms located in the cavernous carotid artery, or small and located in the anterior circulation, or large and located in the posterior circulation, was not cost-effective. Many details of the study were not reported in this paper, which makes it difficult to objectively assess the methodology. So it is not clear if the authors' conclusions were appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of surgery and endovascular treatment of unruptured intracranial aneurysms in patients with a history of subarachnoid haemorrhage from a previous aneurysm.

Interventions
Three interventions were examined for 12 clinical scenarios and two age groups (40 years and 50 years). The interventions were no treatment, surgery, and endovascular treatment. Surgery and endovascular treatment were both compared against no treatment.

Location/setting
Japan/secondary care.

Methods
Analytical approach:
A Markov model was used to model the ongoing risk of aneurysm rupture and the associated costs and health outcomes over time. This was derived from, Takao, et al. 2007 (see ‘Other Publications of Related Interest’ below for bibliographic details). The time horizon was a patient’s lifetime. The authors stated that a societal perspective was taken.

Effectiveness data:
The effectiveness data were derived from published studies. The authors did not report any search methods or inclusion criteria, although these may have been presented in a previous paper (Takao et al 2007). The main clinical parameter was the rupture rates of unruptured intracranial aneurysms.

Monetary benefit and utility valuations:
The utility values for the health states were derived from a previous model developed by the authors (Takao, et al. 2007, see ‘Other Publications of Related Interest’ below for bibliographic details).

Measure of benefit:
The primary measure of benefit was the quality-adjusted life-year (QALY) and these were discounted at an annual rate of 3%.

Cost data:
The cost categories were the costs of hospital stay, physician fees, out-patient care, rehabilitation, nursing home, and home care. The cost estimates appear to have been taken from the previous study, in which two of the authors were involved (Takao, et al. 2007). The price year was 2003 and all costs were converted to US dollars ($). The costs were adjusted to the price year 2003 using the medical component of the consumer price index. They were discounted at an annual rate of 3%.

Analysis of uncertainty:
A probabilistic sensitivity analysis was conducted to account for the uncertainty in the model parameters. The results were presented as 95% confidence intervals around the effectiveness and cost results.

Results
The most cost-effective strategy was dependent on the clinical scenario. For example, at a maximum willingness to pay of $100,000 per QALY gained, in 50-year-old patients, no treatment was the most cost-effective strategy for aneurysms located in the cavernous carotid artery. In three of the four clinical scenarios no treatment dominated surgery and endovascular treatment, which means it was less costly and more effective.

For aneurysms of less than 7mm located in the anterior circulation, no treatment was the most cost-effective strategy. For 7 to 24mm aneurysms, endovascular treatment was the most cost-effective strategy and, for aneurysms of 25mm or more, surgery was the most cost-effective strategy (incremental cost per QALY gained of -$700).

For aneurysms of less than 7mm located in the posterior circulation, endovascular treatment was the most cost-effective option (incremental cost per QALY gained of $78,100). For 7 to 12mm aneurysms, surgery was the most cost-effective option (incremental cost per QALY gained of $2,700) and, for aneurysms of 13mm or more, no treatment was the most cost-effective strategy.

Authors’ conclusions
The authors concluded that, for 50-year-olds with a history of aneurysmal subarachnoid haemorrhage, treatment of unruptured aneurysms that were located in the cavernous carotid artery, or small and located in the anterior circulation, or large and located in the posterior circulation, was ineffective or not cost-effective.

CRD commentary
Interventions:
The interventions were poorly reported, with few details of the endovascular or surgery treatment options.

Effectiveness/benefits:
Few details of the methods used to obtain the effectiveness estimates were reported, the authors stating that the analysis was based on one of their earlier published papers. The use of QALYs as the summary measure of benefit was appropriate, but their derivation was poorly described.

Costs:
The authors reported that a societal perspective was adopted, but only the direct (mainly medical) costs were included. The reporting of the cost analysis was also poor and the reader was referred to the earlier study for details of the cost estimates. Adjustments, including the price year and discounting, were reported, but the exchange rate between the $ and the Japanese yen was not.

Analysis and results:
The authors compared each intervention with no treatment rather than with the next most effective one, in the incremental cost-effectiveness analysis, because they wanted to assess which aneurysms to treat, but this argument does not seem to be valid. They performed an appropriate incremental analysis comparing the two treatments against no treatment, and the full results were presented. The sensitivity analysis was poorly reported. No details of the parameters that influenced the study results were given and no sensitivity analysis around the incremental cost-effectiveness ratios was reported. The lack of detail about the treatment options and the limited reporting of the cost data may make it difficult to generalise the findings to other settings. The authors noted a number of limitations to their analysis.
Concluding remarks:
Many details of the study were not reported in this paper, which makes it difficult to objectively assess the methodology. So it is not clear if the authors' conclusions were appropriate.

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