Screening for familial intracranial aneurysms: decision and cost-effectiveness analysis

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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
This study evaluated the cost-effectiveness of magnetic resonance angiography screening for asymptomatic, unruptured intracranial aneurysms. The authors concluded that the benefit and cost-effectiveness of screening depended on the age at screening and that screening was cost-effective for family members with two or more affected first-degree relatives. Despite a few limitations in costing, the quality of the study was good on the whole, with satisfactory reporting of the methods and results. The authors' conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
This study evaluated the cost-effectiveness of magnetic resonance (MR) angiography screening for 40-year-old patients with asymptomatic, unruptured intracranial aneurysms.

Interventions
The MR angiography screening was compared with a non-screening strategy for asymptomatic, unruptured intracranial aneurysms in 40-year-old family members of patients with aneurysmal subarachnoid haemorrhage (SAH).

Location/setting
Japan/secondary care

Methods
Analytical approach:
Four Markov models were combined with the end branches of a decision tree. The decision tree modelled the probability of different treatments and outcomes following screening or no screening at the age of 40 years. The Markov model captured the health state progression over a lifetime horizon. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinic estimates and transition probabilities used in the model were derived from multiple published sources, which included meta-analyses, systematic reviews, cohort studies, and case-control studies. The aneurysm rupture rates and treatment outcomes were derived from the prospective ISUIA study.

Monetary benefit and utility valuations:
The health state utilities used in the model were based on published literature and authors' assumptions.

Measure of benefit:
The benefit measures included life expectancy, morbidity and mortality related to screening and treatment, and quality-adjusted life-years (QALYs). However, only QALYs were combined with costs in the analysis. The QALYs were discounted at an annual rate of 3%.

Cost data:
Patient and health service costs were included in the analysis. The cost categories included the costs associated with screening, surgery and endovascular treatment, and managing long-term disability. The cost data were derived from published literature and they were discounted at an annual rate of 3%. The price year was 2003 and all costs were in US
dollars ($).

Analysis of uncertainty:
The issue of uncertainty was addressed by carrying out a one-way sensitivity analysis on each model input. A probabilistic sensitivity analysis was also undertaken and cost-effectiveness acceptability curves were presented.

Results
The life expectancy of patients undertaking screening was 39.55 years, and for no screening it was 39.44 years. The morbidity rate was 0.18% for screening and 0.28% for no screening and the mortality rate was 0.05% for screening and 0.43% for no screening.

For patients with two or more affected first-degree relatives, screening resulted in 22.43 QALYs and no screening resulted in 22.40 QALYs, at an average cost of $1,900 for screening and $590 for no screening. The incremental cost-effectiveness ratio (ICER) was $37,400 per QALY gained.

For patients with one affected first-degree relative, screening resulted in 22.45 QALYs and no screening resulted in 22.44 QALYs at an average cost of $1,300 for screening and $290 for no screening. The incremental cost-effectiveness ratio (ICER) was $56,500 per QALY gained.

The sensitivity analysis showed that the model results were quite sensitive to three variables, which were the age at screening, the prevalence of unruptured intracranial aneurysms, and annual rupture rate of 7-12 mm anterior circulation aneurysms.

Authors' conclusions
The authors concluded that the benefit and cost-effectiveness of the MR angiography screening depended on the age at screening, and that the screening was cost-effective for family members with two or more affected first-degree relatives given a cost-effectiveness threshold of $50,000 per QALY.

CRD commentary
Interventions:
The selection of the comparator (i.e. no screening) appears to have been appropriate as it represented the current pattern of care.

Effectiveness/benefits:
The clinical data were obtained from multiple sources, but it was unclear whether a systematic search for data was conducted. However, the authors reported the criteria used to select the primary studies. Most of the evidence came from meta-analyses, which may boost the robustness of the clinical estimates. Nevertheless, details of these studies were not provided. The multiple benefit measures were appropriate and the use of the QALY will facilitate comparisons with the benefits of other health care interventions. The sources of utilities were reported but populations and instruments used to obtain them were not, so it is not possible to tell if they were all consistent.

Costs:
Although the authors stated that a societal perspective was adopted in the analysis, they did not consider productivity costs. The cost data came from the literature, but the authors reported neither information about the sources of the data nor the link between study location and costs. As such, it is impossible to assess whether the cost estimates are appropriate to the authors' setting. In addition, costs were presented as macro categories, which may limit the external validity of the economic analysis. The price year was reported, which will help with replicating the analysis in other time periods. Discounting was appropriately conducted.

Analysis and results:
The model used was adequately described. The synthesis of costs and benefits was appropriate and the results were presented clearly. Given that the cost and effectiveness data were derived from multiple sources and that this may give rise to uncertainty in model inputs, extensive first- and second-order sensitivity analyses were satisfactorily conducted in order to address the issue of uncertainty.
Concluding remarks:
Despite a few limitations in costing, the quality of the study was good on the whole, with satisfactory reporting of the methods and results. The authors' conclusions appear to be valid.

Funding
Not stated.

Bibliographic details

PubMedID
18342771

DOI
10.1016/j.acra.2007.11.007

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Cost-Benefit Analysis; Decision Trees; Female; Humans; Intracranial Aneurysm /diagnosis /genetics; Magnetic Resonance Angiography /economics; Male; Markov Chains; Mass Screening /economics /methods; Middle Aged; Sensitivity and Specificity

AccessionNumber
22008000699

Date bibliographic record published
01/12/2008

Date abstract record published
02/03/2009