Effectiveness and costs of screening for aneurysms every 5 years after 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
This study examined the cost-effectiveness of five-yearly screening, with computed tomography angiography, after successful treatment for subarachnoid haemorrhage. Screening was not cost-effective over no screening, but could be cost-effective for patients with relatively high risks of both aneurysm formation and rupture, or in the management of patients who fear recurrence. The study was based on valid methodology, although some data sources were not extensively reported. The authors’ conclusions appear to be valid, but there was high uncertainty around the results.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of five-yearly screening with computed tomography angiography (CTA) versus no screening, in patients aged 18 to 70 years, who had been successfully treated for subarachnoid haemorrhage (SAH).

Interventions
The five-yearly screening strategy was based on a multi-slice CTA of the brain. For those patients with an abnormal CTA, an intra-arterial angiography was performed to confirm the findings.

Location/setting
Netherlands/hospital.

Methods
Analytical approach:
A published Markov model was updated with data from the Aneurysm Screening after Treatment for Ruptured Aneurysm (ASTRA) study. A long-term horizon was considered with patients being followed from the age of 20 to the age of 70 years. The authors did not explicitly report the perspective of their study.

Effectiveness data:
The clinical data came from a selection of known, relevant studies. The evidence on the patients' characteristics and their risk of aneurysm (regrowth or new growth) was derived from the ASTRA study, which had a final sample of 610 patients who underwent CTA screening (mean age: 53.4 ± 9.1 years, 64% women). These patients were followed up for an average of 8.9 years. Other data, used for the transition probabilities and the CTA accuracy, came from the literature, the details of which were reported in an online appendix.

Monetary benefit and utility valuations:
The utility valuations were derived both from the ASTRA Study and from a published study, the details of which were not reported. No information on the instrument used to elicit the preferences for the ASTRA patients was provided.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure. These were discounted at an annual rate of 4%. Life-years (LYs) were also reported.
Cost data:
The analysis of costs included those of CTA, conventional angiography, preventive treatment coiling or clipping, outpatient visit, coiling or clipping after SAH, and nursing home stay. The economic data were derived from two studies, from the Netherlands, the details of which were not given. All costs were presented in US dollars ($) and Euros (EUR). The price year was not reported. A 4% annual discount rate was applied to future costs.

Analysis of uncertainty:
The issue of uncertainty was addressed by means of several sensitivity analyses. A deterministic univariate analysis was conducted on all model inputs with ranges defined by the authors or derived from the literature. Deterministic two- and three-way analyses of the 10 most influential model inputs and a multivariable probabilistic analysis, in which all the estimates were varied together, by means of a second-order Monte Carlo simulation, were also conducted.

Results
Under the base-case assumptions, the expected QALYs (with LYS in brackets) were 12.18 (21.06) with no screening and 12.04 (21.08) with screening. The total cost per patient was $2,766 (EUR 2,224) with no screening and $4,191 (EUR 3,369) with screening. Hence, no screening was the dominant strategy (it was less expensive and more effective) when QALYs were used as the benefit measure. The incremental cost per LY gained for screening versus no screening was not calculated.

The univariate sensitivity analysis suggested that the risks of formation and rupture of new aneurysms were the most influential model inputs. However, screening was not beneficial when either of these two factors was increased from 1 to 10 times the baseline risk. Only when both these risks were more than twice the baseline values, did screening save costs (without increasing QALYs). When these risks were at least 4.5 times the baseline risk, screening was the dominant strategy. A similar finding was observed when changes in some utility values were made, suggesting high uncertainty around the base-case findings.

The probabilistic analysis showed that the probability that screening was cost-effective at a threshold of EUR 20,000 per QALY was 52%. This was 70% in patients with twice the baseline risks for both aneurysm formation and aneurysm rupture, and 77% in patients with 4.5 times the risks).

Authors’ conclusions
The authors concluded that screening patients with previous SAH cannot be recommended on cost-effectiveness grounds given its higher costs and lower benefits over no screening. However, it might be cost-effective in patients with a relatively high risk of both aneurysm formation and rupture or for management of patients who fear a recurrence.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear in that they were two appropriate strategies in the authors’ setting.

Effectiveness/benefits:
The clinical data came from selected studies. The authors justified their selection of the ASTRA study, which provided recent data on the diagnostic approaches. Extensive information on the patient selection and clinical findings from the ASTRA study was provided. More information on the other sources of data was reportedly presented in the online appendix. The utility weights were also obtained from the ASTRA study but the authors did not describe the instruments used to elicit preferences. The use of QALYs as the summary benefit measure was appropriate given the impact of the disease on both the quality of life and survival. A key assumption was made for the utility value for the state “well treated after SAH”, which was that it was identical for screened and non-screened patients. Small changes in these values had a substantial impact on the cost-effectiveness results.

Costs:
The study perspective was not explicitly reported. Nevertheless, the categories of costs indicate that the viewpoint was that of the health care system. The unit costs were presented for most items, but the details of resource use were not given. Furthermore, the price year was not reported and statistical analyses of costs were not performed. In general, the
economic analysis was not reported in detail.

Analysis and results:
The synthesis of the costs and benefits was appropriately carried out by means of an incremental analysis. The issue of uncertainty was extensively addressed in the sensitivity analysis, the findings of which were clearly presented and discussed. A clear description of the Markov model was provided. The authors highlighted some limitations of their analysis, mainly related to the uncertainty around some model estimates and the need for some assumptions.

Concluding remarks:
Overall, the study appears to have been based on valid methodology, although some sources of data were not extensively reported. The authors' conclusions appear to be valid, but high uncertainty was found around the base-case results.

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