A cost-effectiveness analysis on different surgical strategies for intracranial aneurysms
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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.

Health technology
Surgery for intracranial aneurysms.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
Male and female patients undergoing surgery for intracranial aneurysms.

Setting
Hospital. The economic study was carried out in Milan, Italy.

Dates to which data relate
Effectiveness data relate to the period 1 Jan 90 to 30 Jun 95. Details of the price year and the level of resources used were not provided.

Source of effectiveness data
The evidence for final outcomes was based on a single study.

Link between effectiveness and cost data
Costing was undertaken retrospectively on the same patient sample as that used in the effectiveness study.

Study sample
The sample included 137 patients (42 males and 95 females) who had previously undergone surgery for intracranial aneurysms. 21 had undergone surgery where the aneurysm was unruptured, 60 had early surgery and 56 had delayed surgery. The patients were divided into age groups: under 45 (n=40), 46-54 (n=34), 55-63 (n=28) and over 63 (n=25). Power calculations did not determine sample size.

Study design
The study was a retrospective cohort study, carried out in a single centre. The duration of follow-up was 3 months. 1 patient was lost to follow-up and 17 patients died during the postoperative period.
Analysis of effectiveness
The analysis of effectiveness was based on intention to treat. Main health outcomes were mortality, quality of life and complications. It was not stated whether groups were comparable in baseline characteristics.

Effectiveness results
The aneurysm was successfully clipped in all 137 patients. Complication results were as follows:

77 had no postoperative complications;
28 were diagnosed with ischemia from symptomatic vasospasm (p=0.088);
11 had rebleeding shown at CT before surgery (p=0.127);
11 had hydrocephalus requiring a ventriculo-peritoneal shunt found following surgery (p=0.0012);
8 had significant infective complications;
9 had cardio-vascular complications delaying referral and;
2 had phlebitis.

The authors did not report complications within the specific groups. At 3 months follow-up the mortality rate was 0% for the unruptured aneurisms group, 23.2% for the early surgery group, and 6.7% for the delayed surgery group.

The Glasgow Outcome Scale (GOS) stage was as follows:
complete recovery, 61.9% unruptured aneurisms, 28.6% early surgery and 48.3% delayed surgery;
moderate disability, 19% unruptured aneurisms, 25% early surgery and 25% delayed surgery;
severe disability, 19% unruptured aneurisms, 17.9% early surgery and 15% delayed surgery;
vegetative, 0% unruptured aneurisms, 5.4% early surgery and 5% delayed surgery.

Clinical conclusions
When unruptured aneurysms are excluded, the most important factors influencing a favourable outcome in aneurysm surgery are timing of surgery (delayed surgery), occurrence of rebleeding, vasospasm and hydrocephalus.

Modelling
To estimate benefits and costs a model used in a previous study was adopted. The model assumed that surgery of intracranial aneurysms would permanently remove the risk of subarachnoid haemorrhage and, following surgery, each patient would fall into a class with a probability of life-expectancy dependent on neurological condition and age-related risks, the outcome for each patient then being expressed as quality-adjusted life years.

Measure of benefits used in the economic analysis
The benefit measure was quality-adjusted life years (QALYs). The method of valuation was derived from a previous study. No information was provided on the valuation of health states, number of individuals used to elicit health states and when or how they were valued.

Direct costs
Costs were from the perspective of the health service. Hospitalisation was obtained from DRG reimbursement and
rehabilitation costed on a monthly basis. The year to which the reimbursement rate refers was not clearly stated. No information was provided on resource use. Quantities and costs were not reported separately. No discounting was carried out, even though lifetime costs were considered in the analysis.

**Statistical analysis of costs**
The results of a univariate regression analysis carried out on costs related to different clinical variables, including p-values, was reported.

**Indirect Costs**
The authors stated that lost productivity, due to morbidity and mortality was considered in the analysis, although no further details were provided.

**Currency**
Italian lira (L). No conversion was carried out.

**Sensitivity analysis**
No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**
The mean value of QALY’s adjusted for age and neurological deficit were reported as follows:

For unruptured aneurysm: 0.841 +/- 0.085 for age; 0.927 +/- 0.128 for deficit

For early surgery: 0.871 +/- 0.088 for age; 0.797 +/- 0.224 for deficit

For delayed surgery: 0.867 +/- 0.091 for age; 0.846 +/- 0.221 for deficit.

The mean total number of QALY's corrected for age was calculated to be 26.57 +/- 10.9 for early surgery and 26.58 +/- 12.47 for delayed surgery (p=0.99). For QALY's deficit the results were 24.09 +/- 11.32 for early surgery and 25.77 +/- 13.06 for delayed surgery (p=0.50). The duration of benefits from the intervention was for the patient's lifetime, corrected for age and neurological state after surgery. Benefits were not discounted.

**Cost results**
The treatment cost for an unruptured aneurysm was L7,312.71 (x1000) +/- 196,882. For early surgery the cost was L18,589.30 (x1000) +/- 1,752.08 and for delayed surgery the cost was L17,831.82 (x1000) +/- 1,660.63. It was not stated to which year these costs referred. The costs of side effects were dealt with in the costing.

**Synthesis of costs and benefits**
The incremental cost/QALY for early surgery taking age into account was L26,639,000 for the average case and L29,381,000 taking neurological deficit into account. The incremental cost/QALY for delayed surgery taking age into account was L27,791,000 for the average case and L28,665,000 taking neurological deficit into account. Overall the incremental cost-effectiveness of aneurysm surgery (Cost/QALY) did not differ with respect to the different treatment strategies.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of comparators is clear.
Validity of estimate of measure of benefit
The retrospective observational study design may have introduced biases. Also there was no justification for sample size or whether the sample size was sufficient to carry out any statistical tests. The estimate of the measure of benefit in the present cost-utility analysis has been used from previous research, and it is likely to be biased in the sense that it is not specific to the study in question. Further, it is unclear how the QALY weights were obtained. It is suggested that other studies had estimated postoperative neurological deficits, however, there is very little explanation as to how the other authors obtained these weights.

Validity of estimate of costs
The resource quantities were not reported separately from prices. It is unclear whether any direct costs were omitted due to insufficient information on resource use. Using DRG reimbursement to assess the direct cost of hospitalisation implies that there is no information on resource use reported in the paper. Also the costs of rehabilitation were not adequately described, which may limit their generalisability. Finally, indirect costs were not adequately reported.

Other issues
It is unclear whether the authors' conclusions are justified due to the lack of information on the costing part of the study. Whilst there is sufficient clinical information provided in this paper, the level of detail required for the authors to make clear conclusions is lacking. It is not made explicit what type of modelling is being carried out. The references alluded to, are for Markov modelling, but the description in the text does not expand on this. While using the life expectancy of the Italian population is useful, it is not mentioned whether the population of Milan is representative of the Italian population as a whole. Appropriate comparisons were made with other studies. The issue of the generalisability of the study was not addressed.

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