Carotid stenting versus carotid endarterectomy: evidence basis and cost implications

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 examine the cost-effectiveness of carotid angioplasty plus stenting compared with carotid endarterectomy for the treatment of patients with symptomatic carotid stenosis. The authors concluded that angioplasty plus stenting did not provide a cost-effective alternative to endarterectomy and it should be excluded from routine practice. The methodology appears to have been valid and sound, but the reporting was minimal and, for this reason, it is difficult to assess the authors' conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
The study compared the cost-effectiveness of two treatments for patients with symptomatic carotid stenosis.

Interventions
The interventions were carotid angioplasty plus stenting compared with conventional carotid endarterectomy.

Location/setting
Netherlands/secondary setting.

Methods
Analytical approach:
A Markov model with a 10-year horizon was used. This model was based, with slight modification, on one previously developed by Buskens, et al. 2004 (see 'Other Publications of Related Interest' below for bibliographic details). The perspective adopted was not explicitly stated by the authors.

Effectiveness data:
The effectiveness data were from published studies. Details on these studies used as primary sources were not reported. The primary outcome was perioperative survival after the interventions.

Monetary benefit and utility valuations:
The utility values were from published studies, the details of which were not reported.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the measure of benefit and they were discounted at an annual rate of 4%.

Cost data:
The economic analysis included the procedural costs of the angioplasty, stenting, and endarterectomy, and the resource use related to these procedures was based on actual data from two Dutch hospitals. The costs of myocardial infarction, acute major stroke, and stroke follow-up (including rehabilitation, nursing home, and physical therapy) were also included. These were reported as macro-categories and were from the published literature. The costs were appropriately adjusted for inflation and reported for the price year 2003 in Euros (EUR). They were discounted at an annual rate of 4%.

Analysis of uncertainty:
The parameter uncertainty was investigated using a probabilistic and a deterministic multivariate analysis, varying the
complication rates and, in a separate analysis, varying the procedural costs. The impact of these changes on the costs and benefits was evaluated.

**Results**
The procedural costs were EUR 5,500 for angioplasty plus stenting and EUR 4,012 for endarterectomy. The total expected QALYs were not reported separately. The changes in costs and effectiveness were presented for several scenarios of complication rates and procedural costs.

The analysis demonstrated that angioplasty plus stenting had a low probability of 0.3% of being cost-effective at a cost-effectiveness threshold of EUR 25,000 per QALY.

The cost-effectiveness of the two procedures was highly dependent on the rates of major stroke. The sensitivity analyses demonstrated that a 1% increase in the rate of perioperative major stroke with angioplasty plus stenting resulted in an increase in costs of EUR 1,051 and a loss in QALYs of 0.06.

**Authors’ conclusions**
The authors concluded that angioplasty plus stenting did not provide a cost-effective alternative to endarterectomy and should be excluded from the routine management of patients with severe symptomatic carotid artery stenosis.

**CRD commentary**
**Interventions:**
The rationale for the choice of interventions was reported and you should decide if these are valid health technologies in your setting.

**Effectiveness/benefits:**
No systematic search of the literature was reported. The methods used to identify the primary sources were not presented. It appears that two randomised trials and a Cochrane systematic review were used as the main sources for the effectiveness data, but little information was given on these primary studies. This makes it difficult to make an objective assessment of the validity of the estimates used. Similarly, no details were provided on the utility valuation method. QALYs are a validated measure of benefit, which allow cross-disease comparisons.

**Costs:**
The perspective adopted was not explicitly stated, but from the costs it appears that it was that of the health service provider. The procedural costs were reported in great detail, including a breakdown of the cost items and resource use, but the stroke-related costs were only reported as macro-categories, which limits the transparency of the analysis. Adjustments for inflation, the price year and discounting were all well reported. It was reported, that the uncertainty around the procedural costs was investigated in the sensitivity analysis, but the ranges used for the parameters were unclear.

**Analysis and results:**
The model structure was not clearly reported and a diagram would have been helpful. The issue of uncertainty was only partially addressed, given that the sensitivity analysis was restricted to some model parameters, which limits the robustness of the results. The results of the base case and sensitivity analyses were not satisfactorily reported. The authors acknowledged as a limitation to their study, that the analysis was based on several assumptions, which may have reduced the accuracy of the simulation.

**Concluding remarks:**
The methodology appears to have been valid and sound, but the reporting was minimal and for this reason it is difficult to assess the authors’ conclusions.

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