Is routine duplex ultrasound surveillance after carotid endarterectomy cost-effective?

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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
Surveillance strategies (duplex ultrasound) after carotid endarterectomy (CEA).

Type of intervention
Secondary prevention.

Economic study type
Cost-utility analysis.

Study population
Hypothetical cohort of patients who underwent CEA.

Setting
Hospital. The study was conducted in the USA.

Dates to which data relate
Effectiveness data were collected from studies previously published between 1981 and 1997. Resource use data were collected from studies previously published between 1994 and 1995. The price year was 1996.

Source of effectiveness data
Effectiveness data were derived from a review of previously published studies.

Modelling
A decision-analytic Markov model was developed to determine the costs and clinical outcomes of a cohort of patients who either received ultrasound surveillance or no monitoring.

Outcomes assessed in the review
The review assessed the following outcomes: the rate of significant asymptomatic restenosis of the ipsilateral endarterectomised carotid artery, the rate of significant asymptomatic progression of the contralateral carotid artery, the 30-day probabilities of stroke or death for asymptomatic patients, and the rate of progression to occlusion for patients under surveillance and for patients not under surveillance.

Study designs and other criteria for inclusion in the review
Not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Approximately 15 studies were included in the review.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The annual ipsilateral and contralateral progression to greater than 80% was estimated as 2% and 1.2% per year, respectively. The 30-day probabilities, for asymptomatic patients, of stroke or death were 1.7% for surgical patients and 0.4% for non-surgically treated patients. The rate of stroke after 30 days for surgical patients was 0.6% per year and for non-surgically treated patients was 2.3% per year. A yearly rate of progression to contralateral and ipsilateral occlusion of 0.4% per year was used for patients under surveillance and for patients not under surveillance. The ipsilateral stroke risk was assumed to decrease by 31% after 2 years. It was estimated that 18% of major strokes are fatal and that patients who survive a major stroke face an annual excess mortality of 7.7% per year. Excess mortality rates of 6.3% and 4.7% per year were applied toward symptomatic and asymptomatic patients, respectively.

Measure of benefits used in the economic analysis
The measure of benefits used was Quality Adjusted Life Years (QALYs). Quality weights were derived from previously published utility assessments. Life expectancies were discounted at 3% per year.

Direct costs
Costs were discounted at 3% per year. Quantities and costs were not reported separately. Lifetime treatment costs were estimated including costs of duplex ultrasound, costs of CEA, costs of stroke, and professional fees. The quantity/cost boundary adopted was that of the health service. The estimation of quantities and costs was based on actual data. The costs of CEA and duplex ultrasound were derived from previously published work. Professional fees for surgeons were derived from the 1996 Medicare reimbursement for the appropriate Current Procedural Terminology codes. The price year was 1996.

Statistical analysis of costs
Not reported.

Indirect Costs
Not included.
Currency
US dollars ($).

Sensitivity analysis
One- and two-way sensitivity analyses were conducted on the rate of progression for surgical patients to stenosis, the rate of progression to occlusion, the stroke rate associated with an uncorrected asymptomatic stenosis greater than 80%, patient age, cost of CEA, rate of development of symptomatic lesions, discount rate, and quality-adjustment factors.

Estimated benefits used in the economic analysis
Duplex ultrasound surveillance was associated with 7.41 QALYs, compared with 7.39 QALYs for no surveillance.

Cost results
Costs amounted to $14,583 for duplex ultrasound surveillance and $12,044 for no surveillance.

Synthesis of costs and benefits
An incremental cost-utility ratio of $126,950 per QALY was estimated for duplex ultrasound surveillance compared to no surveillance. The results were sensitive to the rate of progression to greater than 80% stenosis, the rate of progression to occlusion, the stroke rate associated with an uncorrected asymptomatic stenosis greater than 80%, patient age, and cost of CEA, but were insensitive to the rate of development of symptomatic lesions, discount rate, and quality-adjustment factors.

Authors' conclusions
Duplex ultrasound surveillance after CEA is associated with an unfavourable cost-utility ratio. This strategy may have a better cost-utility in younger patients or in those patients who have a more progressive form of disease.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear.

Validity of estimate of measure of benefit
The relevant benefit measure was chosen. More details about how quality weights were derived could have been provided. The results depend on the assumptions made and whether surveillance does reduce the rate of occlusion. The magnitude of this effect is currently unclear.

Validity of estimate of costs
Only direct costs were included. The authors did not discuss the generalisability of the cost results to other settings or countries.

Other issues
The analysis is limited by the lack of standardised data regarding duplex ultrasound surveillance. The reported rates of restenosis vary widely and depend on the frequency of surveillance, the definition of recurrent stenosis, and the interval of follow-up.

Implications of the study
Future studies should examine the impact of frequency and timing of duplex ultrasonography and of protocols targeting duplex ultrasonography to subgroups of patients on its cost-utility.

Source of funding
None stated.
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Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Carotid Stenosis /economics /surgery /ultrasonography; Cohort Studies; Cost-Benefit Analysis; Decision Trees; Disease Progression; Endarterectomy, Carotid /economics; Follow-Up Studies; Health Care Costs; Humans; Male; Morbidity; Outcome Assessment (Health Care) /economics; Population Surveillance /methods; Quality-Adjusted Life Years; Recurrence; Sensitivity and Specificity; Ultrasonography, Doppler, Duplex /economics

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