Assessment of the efficacy of noninvasive screening for patients with asymptomatic neck bruits

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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
Non-invasive screening for patients with asymptomatic neck bruits.

Type of intervention
Screening and diagnosis.

Economic study type
Cost-utility analysis.

Study population
Hypothetical cohort of 20,000 asymptomatic patients with neck bruits.

Setting
Hospital. The study was set in the USA.

Dates to which data relate
Effectiveness and resource use data were collected from studies published between 1975 and 1995. Cost data were collected from the authors' institution during 1995. The price year was 1995.

Source of effectiveness data
Effectiveness data were derived from a literature review.

Modelling
A Markov decision analytic model was used to determine the cost-utility of the test strategies.

Outcomes assessed in the review
The review assessed the annual risk of ipsilateral irreversible stroke and reversible events, and utilities.

Study designs and other criteria for inclusion in the review
Effectiveness estimates were primarily based on the medical arm of recent clinical trials. When data were not available, other sources from the literature were used.

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

Methods used to judge relevance and validity, and for extracting data
Summary statistics from individual studies.

Number of primary studies included
At least 12 studies were included.

Methods of combining primary studies
Narrative method.

Investigation of differences between primary studies
Not stated.

Results of the review
For patients who had just experienced a reversible cerebral event, the risk of an irreversible stroke in the following month was 4.4%. If a stroke did not occur in the following month, then the annual risk of an irreversible stroke was 13%, and the annual risk of a reversible event was 14.5%. For patients who had just experienced an irreversible stroke, the risk of cerebrovascular death in the following month was 17%. If death did not occur, then the annual risk of another irreversible stroke was 14%. For patients with uncomplicated surgeries, the relative risk reduction attributable to surgery was 73% for asymptomatic patients and 80% for symptomatic patients. These risk reductions persisted over the patient’s life. Conventional angiography was 100% sensitive and specific. The combined frequency of tandem lesions and/or cerebral aneurysms was 5%. The accuracy of 3D MRA for detecting these lesions was as follows: sensitivity, 80%; specificity, 95%. The frequency of patients with claustrophobia or metal devices that contraindicated MRA was 5%. The short-term morbidity associated with surgery was equivalent to a 1-week reduction in quality-adjusted survival. 20% of patients with transient ischemic attacks (TIAs) required hospital admission. For transient cerebral events the mean utility was 0.8 and 58% of utilities were between 0.7 and 0.9. The median duration of a transient event was 1 day, and 95% of durations were less than 2 weeks.

Measure of benefits used in the economic analysis
Quality-adjusted life years (QALYs) were used as the measure of benefits. Utilities were discounted at an annual rate of 5%.

Direct costs
Direct costs were discounted at an annual rate of 5%. Quantities and costs were reported separately. Direct costs covered direct professional and technical costs of diagnostic imaging and surgery. The quantity/cost boundary adopted was that of the hospital. The estimation of quantities and costs was based on actual data. Cost data were collected from the authors’ institution. The price year was 1995.

Statistical analysis of costs
Not reported.
Indirect Costs
Not included.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were performed on the following parameters: benefits of surgery, risk of surgery, frequency of unheralded, irreversible stroke, accuracy of 3D TOF MRA, monetary costs of diagnostic tests, stroke-free quality of life, quality of life with stroke, stenosis progression rate, risk of other stroke and non-stroke mortality.

Estimated benefits used in the economic analysis
The test strategies for the wait-and-see management plan generated a mean of 7 QALYs. If the prevalence rate was 10%, screening generated between 7.10 and 7.17 QALYs. If the prevalence rate was 20%, screening generated between 7.14 and 7.19 QALYs. If the prevalence rate was 30%, screening generated between 7.16 and 7.23 QALYs.

Cost results
The cost of the test strategies for the wait-and-see management plan varied between $10,000 and $13,000. If the prevalence was 10%, the costs of the screening strategies varied between $10,810 and $12,158. If the prevalence was 20%, the costs of the screening strategies varied between $10,967 and $12,685. If the prevalence was 30%, the costs of the screening strategies varied between $11,376 and $13,241.

Synthesis of costs and benefits
For the wait-and-see management plan, US then 3D TOF MRA was the preferred strategy for testing symptomatic patients. If the prevalence was 10%, multiple screens with MRA followed by US and 3D TOF MRA had an incremental cost per QALY of $6,900. If the prevalence was 20% or 30%, screen once with US then CA had an incremental cost per QALY of $7,470 and $6,588, respectively. The cost-effectiveness of screening was sensitive to changes in the benefits of surgery, surgical complication rates, quality of life with stroke, rate of stenosis progression, excess morbidity and mortality rates.

Authors' conclusions
Asymptomatic patients with carotid bruits may benefit from screening if the prevalence rate is more than 20%. Ultrasound followed by three-dimensional time-of-flight MR angiography, if indicated, is a promising test strategy.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used, namely that it represented current therapy. You, the user of the database, should decide if these health technologies are relevant to your setting.

Validity of estimate of measure of benefit
The authors did not state that a systematic review of the literature had been undertaken. More details could have been provided about the design of the review and the method of combining primary effectiveness estimates. Estimation of benefits was obtained directly from the effectiveness analysis. The authors noted that the low surgical complication rates used in the model may not be realised at other institutions. The authors did not model the risk of stroke as a potential function of the rate of stenosis progression. The authors assumed that patients would only undergo surgery once.
Validity of estimate of costs
All relevant cost categories were included. Quantities and costs were reported separately. Sensitivity analyses were conducted on costs, and on quantities. Cost estimates were not based on charges which limits the generalisability of the results. The price year was reported.

Other issues
The authors did make appropriate comparisons of their findings with those from other studies. However, the issue of generalisability to other settings was not addressed. The authors did not present their results selectively. The study examined asymptomatic patients with carotid bruits and this was reflected in the authors' conclusions.

Implications of the study
Asymptomatic patients with carotid bruits may benefit from screening if the prevalence rate is more than 20%. Ultrasound followed by three-dimensional time-of-flight MR angiography, if indicated, is a promising test strategy. Diagnostic testing should be performed where the technical and professional staff are adequately trained and experienced, the test protocols are standardised, and there is ongoing quality improvement. More work is needed to understand the role of screening in patients with multiple risk factors in whom increased prevalence of operable lesions is counterbalanced by increased morbidity and mortality from other causes.

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