Population screening for abdominal aortic aneurysm: do the benefits outweigh the costs?

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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
Ultrasound screening for abdominal aortic aneurysm (AAA).

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Two identical, hypothetical cohorts (2000 in each) of men aged 70 years.

Setting
Primary care. The economic study was carried out in UK.

Dates to which data relate
The effectiveness analysis is mainly based on 1987 data. The dates for resource data is not specified. All costs are expressed in 1992 prices.

Source of effectiveness data
Evidence for effectiveness was based on a synthesis of previously completed studies.

Modelling
A decision tree was used to estimate costs and benefits.

Outcomes assessed in the review
Relative risk of mortality and life expectancy.

Study designs and other criteria for inclusion in the review
Best available data taken from existing literature regarding the screening programme and prognosis for aneurysms. Other details were not given.

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
Not clear.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The analysis presumed that the ultrasound test is both 100% sensitive and 100% specific. The uptake rate of the screening programme was 70%.

The control cohort had a yearly relative risk of death (compared with the normal population) of 1.0175 based on a five-year survival curve found in the literature, with an average life expectancy of 8.41 years, whereas the screened cohort has a relative risk of death of 1.031 with an average life expectancy of 8.39 years. (The survival rates were extrapolated beyond five years.)

Measure of benefits used in the economic analysis
Life-years gained.

Direct costs
Direct costs included costs to GPs in consultation time, equipment, half-time screening co-ordinator, radiographer, administration, and consultant radiologist. Salaries included employee benefits. Costs and quantities were reported separately. The cost boundary was the health service. Estimation of screening programme costs was based on the best available evidence on quantities and costs. The costs of emergency surgery and elective surgery were estimated from a West Midlands Hospital (personal communication). Costs were derived using a decision tree model. Price date was 1992.

Currency
UK pounds sterling.

Sensitivity analysis
Sensitivity was investigated for variability in data: discount rate, AAA rupture rate, elective survivor mortality, all survivor mortality, elective operative mortality and the cost of surgery. One-way simple sensitivity analysis was used. Extrapolation of the survival rate was also performed using line-fitting approximations.

Estimated benefits used in the economic analysis
Life-years gained through screening were estimated to be -0.93. Discounted at 5%, life-years gained were estimated to be -1.99. Thus the screening programme appears to do more harm than good. Duration of benefits averaged 8.4 years. Side effects were considered.

Cost results
The cost of screening was 29,670. The discounted costs of elective repairs was 126,250 and of emergency repairs (averted) was 16,780. The total incremental discounted cost was 139,140. Discount rate used was 5%.

Synthesis of costs and benefits
The synthesis is not relevant since incremental benefits were negative and incremental costs were positive. Sensitive parameters were elective survivor mortality, the annual rupture rate and the extrapolated survival curves.

If the annual rupture rate increases by 10% to 0.055, the screening programme benefit becomes positive. Increasing the rate by 40% to 0.07, results in an attractive cost-effectiveness ratio. Improving the survival prospect weighting for elective survivor mortality by a minute amount (to 1.029 from 1.031) causes net life-years gained to become positive. A further small step, constituting a 20% improvement in the base-line assumptions, results in a much lower cost-effectiveness ratio that compares favourably with other currently available programmes. Finally, if normal survival curves to both elective and rupture survivors at all ages were assigned, the ratio becomes very favourable (3460/life year saved).

Authors' conclusions
Screening would lead to a questionable increase in surgery as most patients with AAA die from other causes and not from a ruptured aneurysm. In addition, there is a 5% elective operative mortality. Furthermore, as many of those who have a positive result on screening would never have known that they harbour an aneurysm, there is the possibility of unnecessary anxiety arising from the test.

Although there are considerable uncertainties in the analysis parameters, the base-line result and sensitivity analysis indicate that, on the basis of current knowledge, population screening should not be introduced.

CRD Commentary
The study design is good, although clinical evidence in terms of survival curves are drawn from only a small sample of Swiss men, and there is uncertainty in both values and applicability to UK. This is an appropriate study design with a representative sample and good methodology. One problem, however, might be that the ultrasound test was assumed to be both 100% specific and 100% sensitive. Internal and external validity likely to be upheld. The economic analysis was appropriate. The quantity/cost description is adequate, but based on theoretical costs rather than a sample. Good sensitivity analysis, including justification about sensitive parameters.

Implications of the study
Better information is required about relevant factors such as the annual rupture rate of untreated aneurysms, how this rate changes with age and the survival curves of elective and non-elective surgery.

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