How cost-effective is screening for abdominal aortic aneurysms?


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
The study examined one-off mass screening for abnormal aortic aneurysm (AAA) in men at age 65 years. Screening was based on ultrasound. Annual and 3 monthly follow-up scans for small (aortic diameter 3 to 4.4 cm) and medium (4.5 to 5.4 cm) aneurysms were assumed. Referral for elective surgery was considered at an aortic diameter of 5.5 cm.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis and cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of 65-year-old men.

Setting
The setting was primary care. The economic study was carried out in the UK.

Dates to which data relate
The effectiveness and resource use data were derived from studies published between 2000 and 2002. The costs were expressed as 2000/01 prices.

Source of effectiveness data
The clinical data used in the decision model were:

- the prevalence rate for AAA,
- the accuracy of ultrasound screening,
- the probability of being in an initial health state,
- the transition probabilities between health states, and
- the mortality rates (all-cause and following operation).

Modelling
A Markov model was constructed to reflect a screening strategy for a national programme in the UK. The structure of the model (health states based on aortic diameters), the time horizon (30 years), the length of the cycles (3 months), and details on the transitions across health states were all extensively described and depicted. Distributions assigned to each
model parameter were reported along with details of the coefficients and ranges used for each distribution. Full information on the decision model was provided in a separate study (Kim et al. 2005, see 'Other Publications of Related Interest' below for bibliographic details).

Sources searched to identify primary studies
Most of the model inputs were derived from the population-based MASS that enrolled 67,800 men aged 65 to 74 years in the UK. Patient-level data were available for this trial. All-cause mortality rates came from UK national mortality statistics. Details of the third source of data were not reported.

Methods used to judge relevance and validity, and for extracting data
The primary studies appear to have been identified selectively. The method and conduct of a systematic review of the literature were not reported. The rationale for selecting the MASS was clear since it represented a valid source of epidemiological data for the UK. In addition, the study design and large sample size should have ensured high internal validity. Assumptions had to be made in order to extrapolate short-term data to a longer timeframe.

Measure of benefits used in the economic analysis
The summary benefit measures used were the life-years (LYs) and quality-adjusted life-years (QALYs). The incremental LYs were estimated as survival gained from a reduction in all-cause mortality. Quality-of-life (QoL) adjustments were derived from a study that used population norms for the Euro-QoL Instrument (EQ-5D). However, no further information on these QoL values was provided. Both the LYs and QALYs were discounted at an annual rate of 3.5%. Undiscounted LYs were also reported.

Direct costs
The analysis of the costs was performed from the perspective of the NHS. It included the costs associated with screening (invitation, re-invitation and ultrasound), consultation for elective surgery, and elective and emergency operations. The unit costs and the resource quantities were presented separately for most items. The estimation of resource use was mainly based on data derived from the MASS. The sources of the unit costs were not explicitly stated. The costs were valued using 2000/01 prices. Discounting was relevant given the long timeframe of the analysis and an annual rate of 3.5% was used.

Statistical analysis of costs
The costs and quantities were treated deterministically in the base-case.

Indirect Costs
Productivity costs were not included as they were not relevant given the perspective of the study.

Currency
UK pounds sterling (€).

Sensitivity analysis
A probabilistic sensitivity analysis was carried out, using a Monte Carlo simulation, to address the issue of uncertainty in the cost-effectiveness ratios. The probability distributions assigned to the model inputs were reported. The simulation generated confidence intervals (CIs) around mean estimates of the cost-effectiveness and cost-utility ratios. In addition, different timeframe scenarios were presented.

Estimated benefits used in the economic analysis
Over the 30-year time horizon, the expected discounted (undiscounted) LYs were 11.712 (16.157) in the control group and 11.737 (16.148) in the screening group.

Over the 30-year time horizon, the discounted QALYs were 9.135 in the control group and 9.155 in the screening group.

**Cost results**
The total discounted (undiscounted) costs per patient over the 30-year time horizon were 274.33 (419.11) in the control group and 333.20 (476.02) in the screening group.

**Synthesis of costs and benefits**
The costs and benefits of the alternative strategies were combined by calculating incremental cost-effectiveness ratios and cost-utility ratios.

The incremental cost per LY gained with screening over no screening was 2,320 (95% CI: 1,600 to 4,240).

The incremental cost per QALY gained with screening over no screening was 2,970 (95% CI: 2,050 to 5,430).

The analysis showed that the incremental cost-effectiveness ratios increased as the time horizon of the analysis decreased.

The screening policy would appear to be cost-effective when using the standard threshold over a 6-year time horizon.

In terms of the long-term investment costs of the screening programme (budget impact analysis), the analysis showed that the additional cost of screening the UK male population was 19 million per year.

**Authors’ conclusions**
Compared with no screening, national mass screening for abdominal aortic aneurysm (AAA) in the UK for men aged 65 years was a cost-effective strategy.

**CRD COMMENTARY - Selection of comparators**
The rationale for the selection of the comparators was clear in that the current pattern of care (no screening) was compared with the proposed approach. Alternative imaging methods, such as magnetic resonance imaging or computerised tomography, were not considered because of their substantially higher costs compared with ultrasound. You should decide whether they are valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
No systematic search for data was reported. The parameters for the model were mainly derived from a single, published clinical study. The MASS represents a valid source of data because of the very large number of individuals involved and its randomised design. Details of the other source of data were not provided. However, the authors stated that when MASS data were not available, estimates were taken from systematic reviews where possible, or parameter values were chosen that best reproduced the observed MASS data at 4 years.

**Validity of estimate of measure of benefit**
The choice of LYs and QALYs as the summary benefit measures was appropriate since they capture the impact of the intervention on survival and quality of life, which are relevant dimensions of health for patients at risk of developing an AAA. The methods used to estimate the utility weights were not described as they were taken from a published paper. Discounting was performed according to recent UK guidelines.

**Validity of estimate of costs**
The analysis of the costs was consistent with the perspective of the analysis. A detailed breakdown of cost items for each cost category was not provided, but unit costs for the main items were given. All data used in the economic analysis appear to have been derived from the MASS. The costs appear to have reflected NHS prices, although this was not explicitly stated. The cost estimates were specific to the study setting and the impact of using alternative cost estimates was not explicitly investigated. The costs appear to have been treated deterministically. The price year was reported, which will facilitate reflation exercises in other time periods.

**Other issues**

The authors reported the results from other studies and stated that their findings were similar to those observed in recent modelling studies based on randomised series of patients. Limitations of published models were underlined. The issue of the generalisability of the study results to other settings was not explicitly addressed, although uncertainty was extensively investigated in the probabilistic sensitivity analysis. The results of the analysis were presented clearly.

**Implications of the study**

The study results support the introduction of a mass screening programme for AAA in men. The favourable results obtained in men suggest that screening in women should be reconsidered over a longer perspective.

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**Bibliographic details**


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**Other publications of related interest**

Because readers are likely to encounter and assess individual publications, NHS EED abstracts reflect the original publication as it is written, as a stand-alone paper. Where NHS EED abstractors are able to identify positively that a publication is significantly linked to or informed by other publications, these will be referenced in the text of the abstract and their bibliographic details recorded here for information. Kim LG, Thomson SG, Briggs AH, et al. Evaluating the long-term cost-effectiveness of screening for abdominal aortic aneurysms: development and validation of a Markov model. MRC Biostatistics Unit Technical Report 2005/3. Available at: URL:www.mrc-bsu.cam.ac.uk


