Effectiveness and cost of screening for abdominal aortic aneurysm: results of a population screening program

Wilmink A B, Quick C R, Hubbard C S, Day N E

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
Screening for abdominal aortic aneurysms (AAA) was studied. The comparator was no screening. Given the fact that the incidence and mortality of ruptured AAA were investigated before and after the patients had been invited for screening, patients were used as their own controls.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised the entire male population who were older than 50 years and registered with a general practitioner (GP) in the Huntington District. The study population was the target population.

Setting
The setting was primary care. The economic study was carried out in the Huntington District of Cambridge, UK.

Dates to which data relate
The screening study was carried out from 1st January 1991 to 31st December 2002. The second round of screening was carried out in June 1998. Information on the costs was collected between 1986 and 2000. The price year appears to have been 1995.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken at the same hospital as that in which the patients were treated. The cost data were collected over a shorter time period than in the effectiveness study, but the costing did involve the patients used in the effectiveness study.

Study sample
The sample size was not determined in the planning phase of the study. The sample size for the study was all men aged 50 years and over (approximately 23,300) who were registered with a GP in the Huntington District.
All patients were in the control group until they had been invited for screening, at which point they entered the study group. The aim was to invite the whole study population for screening over the 7-year period. However, in practise, only 90% coverage was achieved because of an increase in the male population. AAA is common in elderly men and results in 1.4% of all deaths in men older than 65 years. The authors therefore sought to undertake a cost-effectiveness analysis of screening with all males. In the study there was a 74% response rate to the screening invitation.

**Study design**

The study design was that of a controlled trial, in which patients were used as their own controls. Follow-up was measured in person-years. For the control group this was calculated by taking the follow-up for the entire study population and subtracting the total follow-up in the screening group.

**Analysis of effectiveness**

The primary health outcome used in the analysis was the number of ruptured AAA prevented with screening. The analysis was conducted on an intention to screen basis. The two groups were comparable at analysis. The number of AAA needed-to-treat was also calculated.

**Effectiveness results**

There were 93 ruptured AAA, 24 in the screening group and 69 in the control group. There was an incidence of rupture of 2.6 per 10,000 person-years (95% confidence interval, CI: 1.7 - 3.8) in the study group and 7.1 per 10,000 person-years (95% CI: 5.6 - 8.9) in the control group.

Screening was likely to have prevented 4.5 ruptured AAA per 10,000 person-years. There were 23,300 men older than 50 years in the district, giving 10.4 ruptured AAA prevented each year. The potential number of lives saved per year with screening was 8. The results showed that 54 life-years were gained per year of screening in a population of 23,000 men at risk.

During the study 149 elective repairs of screening were carried out, 98 of which were detected by screening. On average, 10 elective repairs per year were performed as a result of screening.

The results of the number of AAA needed-to-treat showed that three elective operations were needed to save one life.

**Clinical conclusions**

Screening for AAAs resulted in LYG.

**Measure of benefits used in the economic analysis**

The measures of health benefit used were the LYG by preventing ruptured aneurysms with screening, and the average life-years lost due to preoperative death after the elective repair of aneurysm.

**Direct costs**

The direct costs to the hospital were included in the analysis. These were for emergency or elective AAA repair, stay in the hospital or intensive care unit (ICU), the operating room, and a computed tomography scan. The costs were obtained from actual repair procedures conducted during the study period. All ICU costs were recorded and an average was taken to represent the daily ICU cost for aneurysm surgery. The hospital finance department provided the costs. Expenses incurred during 1995 were used to estimate the average annual cost of the screening programme. The resources quantities and the costs were not reported separately. It was not reported whether discounting was undertaken.

**Statistical analysis of costs**

The data were deterministic.
**Indirect Costs**
The indirect costs were not included in the study.

**Currency**
US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was carried out on the costs of AAA repair, the elective operative mortality rate, and the incidence of ruptured AAA.

**Estimated benefits used in the economic analysis**
There were 54 LYG per year of screening in a population of 23,000 men at risk. Using the hospital's in-hospital elective repair mortality rate of 4% gave an expected loss of life-years of 2.8 each year for the entire population at risk.

The net annual LYG with each year of screening in the study population were 51.2 years (LYG minus loss of life-years).

**Cost results**
The total cost of the screening programme in 1995 was $23,230.

The costs of elective AAA repair were $8,622.

The costs of emergency AAA repair were $11,882.

**Synthesis of costs and benefits**
The cost per life-year saved was $1,107 for the first 5 years, and $425 for the second round of screening.

**Authors' conclusions**
The cost per life-year gained (LYG) of screening for abdominal aortic aneurysm (AAA) compared favourably with those for breast and cervical screening.

**CRD COMMENTARY - Selection of comparators**
Screening was compared with no screening. No screening was an appropriate comparator as it represented current practice.

**Validity of estimate of measure of effectiveness**
The analysis was based on a controlled trial. However, it would have been more appropriate in terms of the study hypothesis if a randomised controlled trial had been undertaken. The study sample was representative of the study population. Each patient acted as their own control, thus the two groups were comparable.

**Validity of estimate of measure of benefit**
Although the number of ruptured AAAs prevented with screening was used to measure the health benefit, to allow meaningful comparisons with other disease areas a measure of quality of life would have been more appropriate.
Validity of estimate of costs
All the categories of cost relevant to the perspective adopted were included in the analysis. The costs and the quantities were not reported separately and no statistical analysis of the quantities was performed. A statistical analysis of the prices was performed. There was no explanation why the study was carried out in the UK but the costs were reported in dollars.

Other issues
The authors made appropriate comparisons of their results with those from other studies. The cost per life-year saved has been shown to be $993, which is similar to the results found in this paper. The authors also addressed the issue of generalisability. The study enrolled men aged 50 years and over and this was reflected in the authors’ conclusions.

Implications of the study
The authors did not make any recommendations.

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Other publications of related interest

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