Primary care screening for abdominal aortic aneurysm
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CRD summary
This review examined the benefits and harms of population-based screening for abdominal aortic aneurysm (AAA). The authors concluded that an invitation to attend AAA screening reduced AAA-related mortality for men aged 65 to 75 years. This was a well-conducted review and the conclusions are likely to be reliable.

Authors' objectives
To examine the benefits and harms of population-based screening for abdominal aortic aneurysm (AAA) by addressing the following questions.

1a) To determine whether AAA screening in asymptomatic average risk or high-risk populations reduces AAA-related adverse health outcomes.

1b) To determine the benefit of repeated screening in those with normal results on initial screen.

2) To identify any harms associated with AAA screening.

3) To determine whether, for AAAs of 3.0 to 5.4 cm detected through screening, immediate repair or surveillance reduces AAA-specific adverse health outcomes.

4) To identify any harms associated with the repair of AAAs greater than or equal to 5.5 cm.

5) To identify any harms associated with the immediate repair or surveillance of 3.0 to 5.4 cm AAAs.

Searching
MEDLINE (from 1994 to 2004), the Cochrane Database of Systematic Reviews and the Cochrane CENTRAL Register were searched for studies published in full in the English language. Additional studies were identified by searching reference lists from pertinent studies and reviews, and by contacting experts.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) only were eligible for questions 1a and 3. RCTs or cohort studies (prospective or retrospective) with a control group were eligible for questions 2, 4 and 5. Follow-up or cohort studies were eligible for question 1b.

Specific interventions included in the review
Studies of population screening were eligible for inclusion for question 1a. The review focused on screening using abdominal ultrasound scanning. Studies that included repeat screening after a normal scan were eligible for inclusion for question 1b. Studies of screening for AAA were eligible for inclusion for question 2. Studies of the treatment of AAA were eligible for inclusion for questions 4 and 5.

Reference standard test against which the new test was compared
The review did not include any diagnostic accuracy studies that compared the performance of the index test with a reference standard of diagnosis. The authors stated in the related journal article (see Other Publications of Related Interest) that they did not explicitly review the accuracy and reliability of ultrasonography in population-based AAA screening.

Participants included in the review
The studies had to be of unselected populations relevant to primary care to be eligible for inclusion. Attendance at screening ranged from 63 to 80%. Most of the studies included men only and the age of the participants ranged from 65 to 83 years. No details on race or ethnicity were given in the included studies.

Outcomes assessed in the review
The studies had to report a health outcome reduction of AAA-specific morbidity, mortality or rupture rate for question 1; explicitly evaluate or discuss harms for questions 2, 4 and 5; or report AAA-specific adverse health outcomes for question 3.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed the eligibility of each study, and any disagreements were resolved by consensus.

Assessment of study quality
Studies of population-based screening were assessed for aspects of internal validity and assigned a rating of 'good', 'fair' or 'poor' according to the U.S. Preventive Services Task Force quality rating criteria. Further details were given in the report. Other studies were not assessed for quality. The authors did not state how many reviewers performed the validity assessment.

Data extraction
Two reviewers extracted the data from each included study. To determine the benefits of population-based screening and immediate repair versus surveillance, data were extracted on the occurrence of AAA-related mortality and all-cause mortality. For other the questions, data on the benefits and harms were extracted from each included study. Data were extracted for studies rated 'good' or 'fair' according to the quality criteria.

Methods of synthesis
How were the studies combined?
For the evaluation of the benefits of population-based screening and immediate repair versus surveillance, the studies were combined using a DerSimonian and Laird random-effects meta-analysis. A pooled odds ratio (OR) with 95% confidence intervals (CIs) was calculated for AAA-related mortality and all-cause mortality. Pooled estimates were also used to populate a hypothetical model of 100,000 men aged 65 to 74 years invited to attend AAA screening versus no screening. Details of this model were given in the report. Studies that addressed other questions were tabulated and presented in a narrative summary.

How were differences between studies investigated?
Differences between the studies were investigated by visual assessment of the graphs of trial outcomes, and the chi-squared test was used to assess heterogeneity. The influence of each study on the effect of population screening for AAA-related mortality was explored by reanalysing the data after omitting each study in turn.

Results of the review
Four population-based RCTs (n=134,937) were included in the review for question 1a, four studies were included for question 1b, four were included for question 2, two were included for question 3, six were included for question 4 and two were included for question 5.

One population-based screening was assigned a 'good' quality rating, and three were assigned 'fair'.

AAA-related mortality and all-cause mortality (question 1a).

In men, the likelihood of AAA-related mortality was significantly lower in those invited to attend screening in comparison with uninvited controls (OR 0.57, 95% CI: 0.45, 0.74, P<0.0001), based on 125,595 men in 4 RCTs. There was no evidence of statistical heterogeneity (P=0.53, I-squared statistic 0%). The likelihood of all-cause mortality was slightly lower in those invited to attend screening, although this was not significant (OR 0.98, 95% CI: 0.95, 1.02), based on 112,937 men in 3 RCTs.
In women, no significant difference was found in the likelihood of AAA-related mortality (OR 1.0, 95% CI: 0.14, 7.07) or all-cause mortality (OR 1.05, 95% CI: 0.92, 1.19), based on 9,342 women in one RCT.

Two of the included studies assessed the potential for selective screening. One study found that the incidence of AAA was higher in men with more than one risk factor (including history of hypertension, acute myocardial infarction or angina pectoris). The second study found that smoking alone would identify most of the AAAs, but would reduce screening by only 34%.

Repeated screening for AAA (question 1b).

Four studies evaluated repeated screening following negative results on ultrasonography. Overall, a single negative ultrasonography screen at age 65 years appeared to virtually exclude any future risk of AAA rupture or death.

Harms associated with AAA screening (question 2).

Four studies determined the harms associated with AAA screening and found no significant differences in physical or psychological harms.

AAA-related mortality and all-cause mortality in immediate repair compared with surveillance for aneurysms 4.0 to 5.4 cm (question 3).

Two studies compared immediate surgical repair with periodic surveillance for AAAs of 4.0 to 5.4 cm and found no significant difference in AAA-related mortality (OR 0.77, 95% CI: 0.54, 1.12, P=0.17) or all-cause mortality (OR 0.97, 95% CI: 0.81, 1.16, P=0.72).

Harms associated with the repair of AAAs greater than or equal to 5.5 cm (question 4).

Several hospital-based database studies have evaluated harms associated with AAA repair. Major treatment-related harms included operative mortality, with a rate of 2 to 6%, and significant risk of major complications, with cardiac complications (10 to 11%) the most common. On the whole, lower mortality rates were found for AAA repairs performed by experienced vascular surgeons in hospitals with high volumes of AAA repairs.

Harms associated with the immediate repair or surveillance of AAAs of 3.0 to 5.4 cm (question 5).

Two studies evaluated such harms. Surveillance was associated with a higher risk of myocardial infarction, but the number of AAA-related hospitalisations was lower than that in the surveillance group. On the whole, general health appeared to be higher in those in the immediate repair group. One study found that immediate repair was associated with higher rates of impotence at one year and a greater decline in maximum activity compared with surveillance.

Authors' conclusions

An invitation to attend AAA screening reduced AAA-related mortality for men aged 65 to 75 years.

CRD commentary

The review addressed several research questions and detailed inclusion criteria were given. Relevant sources were used to identify eligible studies and some attempt was made to locate unpublished studies through contact with experts. However, the inclusion of English language studies only means that some relevant studies might not have been identified. Methods were used to minimise bias and reviewer error in the study selection and data extraction processes. The validity of some of the included studies was assessed using appropriate criteria; an assessment of all of the included studies would have improved the review.

Adequate details on the majority of the included studies were presented, and formal tests of heterogeneity were undertaken where appropriate. The methods used to combine the studies appeared appropriate. The authors' acknowledged the limitations of the review. They highlighted that the population screening studies were conducted in men, and no details were provided on racial or ethnic groups, or on the characteristics of uninvited controls. On the
whole, this was a relatively well-conducted review and the authors’ conclusions can be considered reliable.

**Implications of the review for practice and research**
Practice: The authors stated that primary care providers need to consider factors such as fitness, smoking, age, family history and co-morbidities when determining an individual’s potential benefit from screening.

Research: The authors did not state any implications for further research.

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**Bibliographic details**

**Linked records**
- Primary care screening for abdominal aortic aneurysm: a systematic evidence review for the US Preventive Services Task Force

**Original Paper URL**
http://www.ahrq.gov/clinic/uspstf05/aaascr/aaaser.pdf

**Other publications of related interest**

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.