Primary prevention of cardiovascular disease: evaluation of an individual-based strategy
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Chapter 4

Systematic review of guidelines on abdominal aortic aneurysm screening

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ABSTRACT

Objectives
Usually, physicians base their practice on guidelines, but recommendations on the same topic may vary across guidelines. Given the uncertainties regarding abdominal aortic aneurysm (AAA) screening, physicians should be able to identify systematically and transparently developed recommendations. We performed a systematic review of AAA screening guidelines to assist physicians in their choice of recommendations.

Methods
Guidelines in English published between January 1, 2003 and February 26, 2010 were retrieved using MEDLINE, CINAHL, the National Guideline Clearinghouse, the National Library for Health, the Canadian Medication Association Infobase, and the G-I-N International Guideline Library. Guidelines developed by national and international medical societies from Western countries, containing recommendations on AAA screening were included. Three reviewers independently assessed rigor of guideline development using the Appraisal of Guidelines Research and Evaluation (AGREE) instrument. Two independent reviewers performed extraction of recommendations.

Results
Of 2415 titles identified, seven guidelines were included in this review. Three guidelines were less rigorously developed based on AGREE scores below 40%. All seven guidelines contained a recommendation for one-time screening of elderly men by ultrasonography to select AAAs ≥ 5.5 cm for elective surgical repair. Four guidelines, of which three were less rigorously developed, contained disparate recommendations on screening of women and middle-aged men at elevated risk. There was no agreement on the management of smaller AAAs.

Conclusions
Consensus exists across guidelines on one-time screening of elderly men to detect and treat AAAs ≥ 5.5 cm. For other target groups and management of small AAAs, prediction models and cost-effectiveness analyses are needed to provide guidance.
INTRODUCTION

Abdominal aortic aneurysm (AAA) contributes significantly to disease burden in developed countries, accounting for approximately 0.5% of total mortality in the United States (1). Because rupture of AAA is preceded by a preclinical detectable phase and because accurate tests and effective treatment are available, screening is likely to be beneficial. A recent Cochrane systematic review including four screening trials, showed a significant decrease in AAA-related mortality in asymptomatic men aged 65 to 79 years who underwent ultrasound screening (2). A beneficial effect on total mortality was not demonstrated and uncertainties remain regarding other target groups, the optimal screening strategy, policy towards small AAAs, cost-effectiveness, and psychological effects of screening.

In the United Kingdom, the National Health Service Abdominal Aortic Aneurysm Screening Program is being introduced gradually with a full coverage across England expected by March 2013. In this program, men aged 65 are invited for a one-time ultrasound examination. In the United States, an abdominal ultrasound study for AAA detection is offered as part of the one-time “Welcome to Medicare” preventive health examination. Medicare covers AAA screening for all men who turned 65 years of age and smoked at least 100 cigarettes and individuals with a family history of AAA (3). In many Western countries, however, systematic, nation-wide screening programs are not implemented and decisions on screening are made on the individual level by primary care physicians. For example, in the Netherlands, systematic screening programs are only allowed in a research setting (4). Instead, opportunistic screening of siblings of patients with an AAA is recommended.

The purpose of guidelines is to close the gap between the best available evidence and what physicians do in their practice. The usual method of disseminating and implementing guidelines is rather passive, by publication in medical journals or mailing to targeted professionals. This method does not seem to achieve the guidelines’ aim: changing physicians’ behaviour (5). Variations in recommendations across guidelines on the same topic, may cause physicians to lose confidence in the construction process and validity of guidelines and lead to a further derivation from this aim. In addition, relationships with the industry can potentially influence choices made within guideline development, making the validity of recommendations even more questionable (6). Given the potential uncertainties regarding AAA screening, physicians require recommendations that have been developed systematically and transparently (7). Our purpose was to assist physicians in their choice of recommendations on AAA screening by a systematic review and critical appraisal of current guidelines.

METHODS

Data Sources and Searches
The literature search, used for a previous article on cardiovascular risk assessment (8), was updated to identify guidelines of interest. Briefly, MEDLINE, CINAHL, and four guideline specific databases: the National Guideline Clearinghouse (US), the National Library for Health (UK) on Guideline Finder, Canadian Medical Association Infobase (Canada), and the G-I-N International Guideline Library on (http://www.g-i-n.net) were searched. Guidelines published from
January 1st 2003 to February 26th 2010, and in the English language were considered. Additional guidelines were sought by searching websites of guideline development organizations. The exact search can be obtained from the authors on request.

Study Selection
We considered guidelines on AAA screening. A guideline was only considered if it met the Institute of Medicine (IOM) definition for clinical practice guidelines. In order to meet this definition a guideline has to contain “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances”. In order to meet inclusion criteria, guidelines had to: (1) be developed on behalf of a national or international medical specialty society (2) contain recommendations for an asymptomatic population with no previous diagnosis of AAA; (3) originate from or apply to Western countries (e.g. the US, Canada, Australia, New Zealand or the UK). Titles and abstracts were reviewed independently by two reviewers (B.S.F. and E.B.C.). Articles were only excluded if both reviewers agreed on the decision. Discrepancies were resolved by consensus. The first author made the final selection of articles based on full text.

Data Extraction and Quality Assessment
Relevant recommendations from the included guidelines were independently extracted by two reviewers (B.S.F. and N.G). Discrepancies were resolved by consensus. Each guideline provided one or more relevant recommendations. Data extracted included the reported methodology for evidence synthesis, formulating of recommendations, consideration of cost-effectiveness, the target population, the strategy for delivery of the test, recommended tests, and test thresholds for intervention and follow-up. In addition, the recommendation was classified as “for”, “consider”, “not for not against”, “insufficient evidence” or “against”.

The quality of development of each included guideline was determined using the “Rigor of Development” domain of the Appraisal of Guidelines Research and Evaluation (AGREE) instrument, a 7 item score (9). This score looks at: (1) methods to search for evidence; (2) criteria for selecting the evidence; (3) methods for formulating the recommendations; (4) consideration of health benefits, side effects, and risks; (5) supporting evidence; (6) procedures for external peer review; and (7) the update process. Each item is rated on a 4-point Likert scale. Three reviewers (B.S.F., N.G., and J.J.V.) independently scored each guideline. Additional information on development was also examined by these three reviewers by perusing websites of guideline developers. For each reviewer, AGREE scores were calculated as a percentage using the sum of the 7 items and the maximum possible score. Final rigor scores were calculated by averaging the AGREE scores from all reviewers (see the eTable for AGREE item scores per guideline). Reproducibility of the three reviewers’ average rigor scores was measured with an intraclass correlation coefficient. We ranked included guidelines according to their average score. Editorial independence from funding body, external funding, and disclosure of relationships with industry by individual guideline group members were assessed (B.S.F.) and checked (N.G.). Discrepancies were resolved by consensus. SRS® 4.0 (Mobius Analytics, Ottawa, Ontario, Canada), a web-based software package developed for systematic review data management was used to remove duplicates, store citations and track results at title, abstract, quality assessment and data extraction levels.
Data Synthesis and Analysis
We constructed a table to compare the recommendations from the included guidelines. The table was divided into the following sections: (1) methodology of guideline development; (2) consideration of cost-effectiveness regarding the recommendation; (3) target group and delivery of AAA screening; (4) tests considered; and (5) thresholds for intervention and follow-up.

RESULTS

Selection and Assessment of Guidelines
We screened 2415 guidelines for eligibility at title level, of which 416 were included for review at abstract level (Figure 1). Of these, 7 guidelines relevant to AAA screening were eligible for full data extraction. Table 1 summarizes the selected guidelines, together with rigor scores and conflict of interest results. Most guidelines (6 of 7) were developed in North America. AGREE scores varied from 17% to 79% with 3 guidelines (CCS, SVS1, and SVS2) having an AGREE score below the median, 40%. Reproducibility of the AGREE scores by the three reviewers was good, with an intraclass correlation coefficient of 0.86. In 2 of the 7 guidelines (ACC, SVS2) at least one panel member declared having a relevant financial relationship with the industry. None of these guidelines reported exclusion of group members from voting or discussions. Only one guideline (USPSTF) contained a statement of being developed independently from the funding organization. One guideline (NSC) neither reported that it was developed independently from funding organization(s), nor did it report a statement about conflicts of interest of group members.

The 7 included guidelines contained 11 recommendations on AAA screening (Table 2). Two (USPSTF and ACC) of the 7 guidelines were developed on the basis of a systematic review of the medical literature. The remaining 5 guidelines were developed using a non-systematic selection of previously developed systematic reviews or primary research. Evaluation of cost effectiveness of screening strategies was done in 6 of 7 guidelines, by reviewing existing decision modeling studies.

Areas of Agreement and Disagreement among Recommendations
All guidelines contained at least one recommendation that supported AAA screening in elderly men. Although guideline groups (6 of 7) generally agreed on the age at which screening should be started in elderly men (that is 65 years of age), they disagreed on whether a smoking history should be present or not. In recommendations from two (USPSTF and ACC) of the 7 guidelines, ever smoking (current or past smoking) was required. In the other 5 guidelines screening was recommended for elderly men regardless of smoking habits. Three guidelines (USPSTF, ACC, and NSC) only contained recommendations for AAA screening in elderly men or recommended explicitly against screening women. These three guidelines had the highest AGREE scores. Guidelines with lower AGREE scores also contained recommendations for other target groups. Four guideline groups (CSVS, CCS, SVS1, and SVS2) recommended screening in women if risk factors for development of AAA are present. Although in two of these guidelines (CSVS and CCS) multiple risk factors were required, in two guidelines (SVS1 and SVS2) the presence of one risk factor was considered sufficient reason to screen.
Three guidelines (CCS, SVS1, and SVS2) recommended screening of middle-aged men (that is 50 or 55 years) if a family history of AAA is present. Although not all guideline groups reported an age criterion when screening should no longer be offered, in most guidelines (4 of 7) 75 years of age was considered as the upper age limit. Abdominal ultrasonography was unanimously advocated as the primary screening test and only one guideline group (ACC) recommended physical examination as a useful screening tool in addition to ultrasonography. All guideline groups recommended elective surgical repair at an abdominal aortic diameter of 5.5 cm in elderly men. Some guideline groups advocated using a lower threshold (i.e., 5.0 cm) for women (CCS and SVS2) or young healthy patients (SVS2) as an indication for surgical repair.

Except for the USPSTF guideline, all guidelines contained recommendations for surveillance of those with aneurysms smaller than 5.5 cm in diameter. These recommendations, however, varied across the guidelines with respect to the intensity of follow-up and aorta diameter cutoff values for the monitoring intervals. The two Canadian guideline groups (CSVS and CCS) were unique in recommending periodic re-screening for individuals with abdominal aortic diameters below 3 cm; the remaining guideline groups recommended one-time screening.
Figure 1. Literature search and selection. Numbers of guidelines of each step of the process are indicated. Group totals may exceed the reported numbers for the excluded articles at abstract and full text level because several reasons for exclusion were allowed. AAA, Abdominal aortic aneurysm; CMA, Canadian Medical Association; NGC, National Guideline Clearinghouse.
DISCUSSION

In summary, we identified 7 guidelines on AAA screening. A majority of guidelines lacked a systematic method for the evaluation of the evidence or achieved a low AGREE score for rigor of development. Most guidelines contained recommendations that were in favor of one-time AAA screening for men 65 years and older using ultrasonography. Four guidelines, of which three had low AGREE scores, also contained disparate recommendations on screening women and middle-aged men at elevated risk, whereas guidelines with higher AGREE scores did not. Although an abdominal aortic diameter of 5.5 cm was unanimously used as criterion for elective surgical repair in elderly men, no consensus existed on management of smaller AAAs. A previously published review already summarized and discussed a selection of 3 guidelines on AAA screening, but the review was neither systematic nor were the selected guidelines appraised on quality (10). We used a sensitive search strategy to identify guidelines and we assessed the included guidelines by a validated tool, the AGREE instrument. Our article can also have additive value to guideline summaries provided by the National Guideline Clearinghouse, as this database has only summarized some of the guidelines that we reviewed, and does not appraise guidelines on quality of development (11). We tried to create awareness of differences across guidelines from Western countries, which generally have a comparable population health status and access to medical resources (12). The differences, which we identified, can have major implications for clinical practice. Because most guidelines were produced by North American organizations, this report is most valuable to guide physicians from this region in choosing which recommendations to follow. Physicians may decide on the basis of AGREE scores and their specific clinical context which recommendations to adopt or to avert.

Despite these strengths, we have to face certain limitations of our review. First, we neither evaluated the source nor the quality of the underlying evidence that supported the recommendations, but instead assessed the guidelines’ construction processes. For example, disparate evidence cited by guideline developers could provide possible causes for variation in recommendations. Transparent development methods and complete information on how judgments were made increase the reliability of recommendations and allow physicians to make more informed decisions on adopting them. Which recommendations would result in better outcomes can be determined in comparative effectiveness research (13), but this was beyond the scope of our review. Second, the AGREE instrument only considers the details of reporting information related to the development of the guideline. The true quality of the guideline can, therefore, not be fully captured. For example, a guideline group which performs a systematic search for evidence and which does not report detailed information on the search strategy followed, will receive a low AGREE score for this item. In reality, the search followed may be adequate for identifying solid evidence. Although we did search the organization’s website for additional background information, we did not contact guideline developers for additional information that was lacking in the guideline document or on the website. Third, the AGREE instrument provides a quality score on a linear scale. This means that each item is weighed equally. We believe that all items of the AGREE Rigor of Development domain are relevant, supporting equal weighting across items. The contribution of each individual item to
the total quality of a guideline is however difficult to assess. Fourth, it was difficult to quantify the true degree of influence by industry relationships. We had to rely on the disclosures that were believed to be relevant for decision-making by group members themselves. We also could not assess the size of entanglements with industry, because guidelines did not report the payment amounts received.

Although all guidelines agreed upon screening elderly men, some guidelines advocated a more selective screening regime based on smoking history. Selective screening instead of whole population screening could result in too many missed AAAs (14). Nevertheless, a modeling study showed that selective screening of men aged 65 to 75 years who have ever smoked, as recommended by the USPSTF and ACC, did not severely affect the detection rate (15). Using ever-smoking as pre-selection tool, however, potentially has the disadvantage that ever-smoking not only acts on prevalence of AAA, but also on co-morbidities (16). The expected gain in life years by AAA screening could then be nullified by the raised competing risk due to other death causes. This was not taken into account for calculation of the effectiveness of screening in the previously mentioned modeling study (15). Other guideline groups recommended screening also in populations other than men aged 65 to 75 years if risk factors are present, e.g. men aged 50 to 65 years, men older than 75 years, and women. For these populations, no clear evidence exists from experimental research for such a recommendation. The reasoning is that the risk of having an AAA is markedly increased if risk factors are present. The odds ratio, however, generally needs to be high before a risk factor can be used for risk classification (17). The odds ratios of single risk factors other than smoking are low for clinically relevant large AAAs (14,18). Therefore, combining risk factors may be warranted to avoid unnessary ultrasonographies and overdiagnosis of small AAAs for which the optimal treatment strategy is unclear (19, 20). On the other hand, when screening is recommended both at a younger age if risk factors are present and at an older age regardless of risk factors, such in ACC, CCS, SVS1, and SVS2 guidelines, then a bias similar to lead time bias could occur. Only the AAAs, which are vulnerable to rupture in the short term contribute to benefit of screening at an earlier age. Slowly growing AAAs would most likely be identified at the older screening age. The additional benefit of screening in middle-aged men and women at elevated risk can be explored by comparing the different screening strategies in a decision analysis.

The variation in recommendations for policy towards small asymptomatic AAAs is relevant, because with screening approximately 90% of the detected AAAs will be smaller than 5.5 cm in diameter (18, 21). Two guideline groups (CCS and SVS2) suggested using smaller diameters for women and healthy young patients as threshold for elective surgical repair. Two meta-analyses did not show an improvement of overall survival in the immediate surgical repair group as compared to those allocated to surveillance (19,20). There was insufficient power to identify subgroups, that might benefit from immediate repair. A recent published trial not included in the two meta-analyses also did not demonstrate a benefit on overall mortality after immediate endovascular repair, although this trial was stopped earlier because the event rate of the primary outcome measure of rupture or aneurysm related death was too low to achieve sufficient statistical power (22). According to the Cochrane review (20), an individual patient-level data meta-analysis is underway to conduct subgroup analyses, which are expected to elucidate risks and benefits of each treatment option for aneurysm size subgroups, and age...
subgroups (for example ≤ 69 years, and > 69 years). Multivariable prediction models of rupture and operative risk could also be used to identify those expected to benefit from immediate surgical repair. Multiple predictors determine rupture (23, 24) and operative risk (25) and therefore variation in treatment effect is difficult to be captured by single patient characteristics. The use of prediction models for rupture risk and operative risks has the advantage that predictors that influence both, for example female sex (26) can be taken into account. A combination of a high predicted rupture risk and a low predicted operative risk is then likely to result in a survival benefit from immediate surgical repair. In the absence of experimental evidence for a survival benefit, the trade-off between immediate surgical repair and surveillance can be based on costs and quality of life by using decision modeling and cost-effectiveness analyses. Also the optimal screening and monitoring intervals can then be evaluated. Although methods are available for integrating various recommendations into a single guideline, our purpose was not to create a new “universal” AAA screening guideline. However, a summarizing screening algorithm comprising the recommendations which the guidelines had in common and our suggestions for future research is depicted in figure 2. The actual implementation of these recommendations in primary care is critical in optimizing patient outcomes. Methods to measure and improve the delivery and adherence of AAA screening interventions are for example performance measures and decision support systems, but these are still topics for further research (27, 28).

**CONCLUSION**

Consensus exists across guidelines on one-time screening of elderly men to detect and treat AAAs ≥ 5.5 cm. For strategies towards other target groups, and management of small AAAs, prediction models and cost-effectiveness analyses are needed to provide guidance.
Figure 2. Summarizing screening algorithm and suggestions for future research. 

Restricting this target group by adding a history of smoking requires the reduced life expectancy caused by smoking to be taken into consideration in decision analysis. Multivariable modeling to predict abdominal aortic aneurysm (AAA) risk can be used to identify groups at high risk within men 50 to 65 years, men 75 years, and women 60 years. Variables to consider are age, gender, family history of AAA, history of smoking, history of cardiovascular disease, other cardiovascular risk factors. The expected benefit of screening these groups can be calculated by decision analysis. Prediction models considering variables such as age, gender, aortic diameter size, smoking status, blood pressure, history of cardiovascular disease, pulmonary and renal impairment can estimate these risks. The optimal intervals for periodic ultrasound scan surveillance can be calculated with cost-effectiveness analysis.

Topics for future research:

a. Restriction to history of smoking

b. Identification of other high risk individuals

c. Identification of those with a small AAA who will benefit from surgical repair

d. Calculation of optimal periodicities of surveillance
Table 1. Characteristics of 7 Guidelines on AAA Screening

<table>
<thead>
<tr>
<th>Guideline, Year</th>
<th>Organization(s) Responsible for Guideline Development</th>
<th>Country that guideline applies to</th>
<th>AGREE Rigor Score, %</th>
<th>Conflicts of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>USPSTF, 2005</td>
<td>U.S. Preventive Services Task Force</td>
<td>United States of America</td>
<td>79%</td>
<td>EI</td>
</tr>
<tr>
<td>ACC, 2005</td>
<td>American College of Cardiology and American Heart Association</td>
<td>United States of America</td>
<td>63%</td>
<td>SO</td>
</tr>
<tr>
<td>NSC, 2007</td>
<td>National Screening Committee</td>
<td>United Kingdom</td>
<td>41%</td>
<td>-</td>
</tr>
<tr>
<td>CNS, 2007</td>
<td>Canadian Society for Vascular Surgery</td>
<td>Canada</td>
<td>40%</td>
<td>SO</td>
</tr>
<tr>
<td>CCS, 2009</td>
<td>Canadian Cardiovascular Society</td>
<td>Canada</td>
<td>38%</td>
<td>-</td>
</tr>
<tr>
<td>SVS, 2009</td>
<td>Society for Vascular Surgery</td>
<td>United States of America</td>
<td>25%</td>
<td>SO</td>
</tr>
</tbody>
</table>

AAA, Abdominal aortic aneurysm; AGREE, Appraisal of Guidelines Research and Evaluation; EI, editorial independence declared; SO, statement about conflicts of interest of group members present.

*Relationship with industry reported by any group member.

Table 2. Recommendations (n=12) in Guidelines (n=7) on Screening for Abdominal Aortic Aneurysm

<table>
<thead>
<tr>
<th>AGREE rigor score, %</th>
<th>USPSTF</th>
<th>USPSTF</th>
<th>USPSTF</th>
<th>ACC</th>
<th>NSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method to evaluate evidence</td>
<td>Meta-analysis; systematic review</td>
<td>Meta-analysis; systematic review</td>
<td>Meta-analysis; systematic review</td>
<td>Systematic review</td>
<td>Systematic review; review of published systematic reviews, meta-analyses or guidelines; review of cost-effectiveness studies; review of cost-effectiveness studies</td>
</tr>
<tr>
<td>Method to formulate recommendations</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
</tr>
<tr>
<td>Target group</td>
<td>Men aged 65 - 75 y who have ever smoked</td>
<td>Men aged 65 - 75 y who have never smoked</td>
<td>Women</td>
<td>Men aged 60-64 who are siblings or offspring of patients with AAA; men aged 65-74 who were never smoked</td>
<td>Men aged 65 y</td>
</tr>
<tr>
<td>Strategy</td>
<td>Opportunistic screening / case-finding</td>
<td>Opportunistic screening / case-finding</td>
<td>Opportunistic screening / case-finding</td>
<td>Not reported</td>
<td>Population-based / mass screening</td>
</tr>
<tr>
<td>Recommendation</td>
<td>For</td>
<td>Not for not against</td>
<td>Against</td>
<td>For</td>
<td>For</td>
</tr>
<tr>
<td>Primary screening tests</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
</tr>
<tr>
<td>Intervention(s)</td>
<td>Endovascular repair or open surgical repair if AAA ≥ 5.5 cm</td>
<td>Endovascular repair or open surgical repair if AAA ≥ 5.5 cm</td>
<td>Endovascular repair or open surgical repair if AAA ≥ 5.5 cm</td>
<td>Surgical repair if infrarenal or juxtarenal AAA ≥ 5.5 cm; repair is probably indicated in patients with suprarenal or type IV thoracoabdominal aortic aneurysms 5.5 - 6.0 cm, no intervention if infrarenal or juxtarenal AAA 4.0 - 5.4 cm, but repair can be beneficial in patients with infrarenal or juxtarenal AAA 5.0 - 5.4 cm</td>
<td>Referral to a vascular surgeon if AAA ≥ 5.5 cm</td>
</tr>
<tr>
<td>Surveillance</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Monitoring by ultrasound or computed tomographic scans every 6 to 12 months to detect expansion if infrarenal or juxtarenal AAA ≥ 5.5 cm; monitoring by ultrasound examination every 2 to 3 years if AAA is smaller than 4.0 cm in diameter</td>
<td>Referral to a vascular surgeon if AAA ≥ 5.5 cm</td>
</tr>
<tr>
<td>Screening Intervals</td>
<td>One-time screening</td>
<td>One-time screening</td>
<td>One-time screening</td>
<td>One-time screening if not in above categories</td>
<td>One-time screening if not in above categories</td>
</tr>
</tbody>
</table>
## Table

<table>
<thead>
<tr>
<th>CCS</th>
<th>CSVs</th>
<th>CSVs</th>
<th>CSVs</th>
<th>CSVs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGREE rigor score, %</strong></td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Method to evaluate evidence</strong></td>
<td>Review of published systematic reviews, meta-analyses or guidelines, review</td>
<td>Review of published systematic reviews, meta-analyses or guidelines, review</td>
<td>Review of published systematic reviews, meta-analyses or guidelines, review</td>
<td>Review of published systematic reviews, meta-analyses or guidelines, review</td>
</tr>
<tr>
<td><strong>Method to formulate recommendations</strong></td>
<td>Expert consensus</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
<td>Expert consensus</td>
</tr>
<tr>
<td><strong>Consideration of costs</strong></td>
<td>Review of cost-effectiveness studies and published systematic review of cost effectiveness studies; cost effectiveness analysis using projection of real cost data</td>
<td>Review of cost-effectiveness studies and published systematic review of cost effectiveness studies; cost effectiveness analysis using projection of real cost data</td>
<td>Review of cost-effectiveness studies and published systematic review of cost effectiveness studies; cost effectiveness analysis using projection of real cost data</td>
<td>Review of cost-effectiveness studies and published systematic review of cost effectiveness studies; cost effectiveness analysis using projection of real cost data</td>
</tr>
<tr>
<td><strong>Target group</strong></td>
<td>Men aged 65 - 75 y who are candidates for surgery and are willing to participate</td>
<td>Women aged &gt; 65 y and multiple RFs</td>
<td>Women aged &gt; 65 y, adult population aged &lt; 65 y</td>
<td>Deducted from text: Men aged &gt; 75 y and multiple RFs</td>
</tr>
<tr>
<td><strong>Strategy</strong></td>
<td>Population-based / mass screening</td>
<td>Individualized investigation</td>
<td>Population-based / mass screening</td>
<td>Individualized investigation</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
<td>Consider</td>
<td>Against</td>
<td>Consider</td>
<td>Against</td>
</tr>
<tr>
<td><strong>Primary screening tests</strong></td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
<td>Abdominal ultrasonography</td>
</tr>
<tr>
<td><strong>Intervention(s)</strong></td>
<td>Deducted from text: surgical repair at 2.55 cm</td>
<td>Deducted from text: surgical repair at 2.55 cm</td>
<td>Deducted from text: surgical repair at 2.55 cm</td>
<td>Deducted from text: surgical repair at 2.55 cm</td>
</tr>
<tr>
<td><strong>Surveillance</strong></td>
<td>Policy not clearly described in guideline if AAA 4.4 - 5.4 cm; an annual abdominal ultrasound is an acceptable practice if AAA 3.0 - 4.4 cm. The true effective interval of re-screening is unknown for this group and it is likely that every 2 years is also acceptable for the smaller aneurysms</td>
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</tr>
<tr>
<td><strong>Screening intervals</strong></td>
<td>No follow-up ultrasound is necessary before 3-105 years if aortic diameter ≤ 3.0 cm</td>
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<td>No follow-up ultrasound is necessary before 3-105 years if aortic diameter ≤ 3.0 cm</td>
</tr>
</tbody>
</table>

### Notes
- **AAA**: Abdominal aortic aneurysm
- **ACC**: American College of Cardiology
- **AGREE**: Appraisal of Guidelines Research and Evaluation
- **CSVS**: Canadian Society for Vascular Surgery
- **CCS**: Canadian Cardiovascular Society
- **NSC**: National Screening Committee
- **RFs**: Risk factors
- **SYS**: Society for Vascular Surgery
- **USPSTF**: United States Preventive Services Task Force
- **Level of recommendation is weak, or benefit is uncertain.**

### Systematic review of guidelines on AAA screening

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>For</th>
<th>For</th>
<th>For</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary screening tests</td>
<td>Referral to a vascular surgeon if AAA ≥ 4.5 cm; surgical repair if men AAA ≥ 5.5 cm and if women AAA ≥ 5.0 cm; consider surgical repair if ≥ 0.5 cm growth in 1 year</td>
<td>Surgical repair if fusiform AAA ≥ 5.5 cm, saccular AAA, young healthy patients, and especially women with AAA ≥ 5.5 cm, statins, smoking cessation, ACE inhibitor/angiotensin receptor blocker therapy if surveillance (AAA ≥ 5.5 cm: not clearly described)</td>
<td>Surgical repair if AAA ≥ 5.0 cm; surgical repair if AAA ≥ 5.5 cm, policy not clearly described</td>
<td>Referral to a vascular specialist if AAA ≥ 4.5 cm; surgical repair if AAA ≥ 5.5 cm, policy not clearly described</td>
</tr>
<tr>
<td>Interventions(s)</td>
<td>Repeat ultrasound every 6 months if AAA ≥ 4.5 cm; repeat ultrasound every year if AAA ≥ 4.5 cm; repeat ultrasound in 2 years if AAA ≥ 5.0 cm; repeat ultrasound in 3 years if AAA ≥ 3.4 cm</td>
<td>Repeat ultrasound every 6 months if AAA ≥ 4.5 cm; repeat ultrasound every year if AAA ≥ 4.5 cm; repeat ultrasound in 1 year if AAA ≥ 3.5 cm; repeat ultrasound every 2 years if AAA ≥ 3.4 cm; repeat ultrasound in 3 years if AAA ≥ 3.1 cm; repeat ultrasound every 5 years if AAA ≥ 2.9 cm</td>
<td>Repeat ultrasound every 6 months if AAA ≥ 4.5 cm; annual ultrasound examination if AAA ≥ 4.0 cm</td>
<td>Repeat ultrasound every 6 months if AAA ≥ 4.5 cm; annual ultrasound examination if AAA ≥ 4.0 cm</td>
</tr>
<tr>
<td>Surveillance</td>
<td>Refer to vascular surgeon if AAA ≥ 4.5 cm; consider surgical repair if ≥ 0.5 cm growth in 1 year</td>
<td>Consider surgical repair if ≥ 0.5 cm growth in 1 year</td>
<td>Consider surgical repair if ≥ 0.5 cm growth in 1 year</td>
<td>Consider surgical repair if ≥ 0.5 cm growth in 1 year</td>
</tr>
<tr>
<td>Screening intervals</td>
<td>One time screening if aortic diameter ≤ 2.6 cm and 65 years of age or older; not reported if aortic diameter ≤ 2.6 cm and age 55 - 65 years of age</td>
<td>One time screening if aortic diameter ≤ 2.6 cm and 65 years of age or older; not reported if aortic diameter ≤ 2.6 cm and age 55 - 65 years of age</td>
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<td>One time screening if aortic diameter ≤ 2.6 cm and 65 years of age or older; not reported if aortic diameter ≤ 2.6 cm and age 55 - 65 years of age</td>
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</table>

AAA: Abdominal aortic aneurysm; ACC, American College of Cardiology; AGREE, Appraisal of Guidelines Research and Evaluation; CCS, Canadian Cardiovascular Society; CSVS, Canadian Society for Vascular Surgery; NSC, National Screening Committee; RFs, risk factors; SYS, Society for Vascular Surgery; USPSTF, United States Preventive Services Task Force; Past or current smokers; Family history of AAA, smoking history, cerebrovascular disease, age 70 years old; Level of recommendation is weak, or benefit is uncertain.
REFERENCES


