U.S. Preventive Services Task Force

# Screening for Abdominal Aortic Aneurysm: Recommendation Statement

▶ See related Putting Prevention into Practice on page 563, article on page 538, and editorial on page 518.

As published by the U.S. Preventive Services Task Force.

This summary is one in a series excerpted from the Recommendation Statements released by the USPSTF. These statements address preventive health services for use in primary care clinical settings, including screening tests, counseling, and preventive medications.

The complete version of this statement, including supporting scientific evidence, evidence tables, grading system, members of the USPSTF at the time this recommendation was finalized, and references, is available on the USPSTF website at http://www.uspreventiveservicestaskforce.org/.

This series is coordinated by Sumi Sexton, MD, Associate Medical Editor.

A collection of USPSTF recommendation statements published in *AFP* is available at http://www.aafp.org/afp/uspstf.

## Summary of Recommendations and Evidence

The U.S. Preventive Services Task Force (USPSTF) recommends one-time screening for abdominal aortic aneurysm (AAA) with ultrasonography in men ages 65 to 75 years who have ever smoked *(Table 1)*. **B recommendation.**

The USPSTF recommends that clinicians selectively offer screening for abdominal aortic aneurysm in men ages 65 to 75 years who have never smoked rather than routinely screening all men in this group. Evidence indicates that the net benefit of screening all men ages 65 to 75 years who have never smoked is small. In determining whether this service is appropriate in individual cases, patients and clinicians should consider the balance of benefits and harms on the basis of evidence relevant to the patient's medical history, family history, other risk factors, and personal values. **C recommendation.**

See the Clinical Considerations section for additional information on risk assessment.

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for AAA in women ages 65 to 75 years who have ever smoked. **I statement.**

See the Clinical Considerations section for suggestions for practice regarding the I statement.

The USPSTF recommends against routine screening for AAA in women who have never smoked. **D recommendation.**

These recommendations apply to asymptomatic adults age 50 years or older.

For the purposes of this recommendation, an "ever-smoker" is a person who has smoked at least 100 cigarettes in his or her lifetime.

## Rationale

### IMPORTANCE

Abdominal aortic aneurysms are typically defined by an aortic diameter of 3.0 cm or larger. Population-based studies in adults older than 50 years have found that the prevalence of AAA is 3.9% to 7.2% in men and 1.0% to 1.3% in women.[1,2] It is important to consider potential screening strategies for AAA because most AAAs are asymptomatic until they rupture. Although the risk for rupture varies greatly by aneurysm size, the associated risk for death is as high as 75% to 90%.[1,2]

### DETECTION

Evidence is adequate that ultrasonography is a safe and accurate screening test for AAA.

### BENEFITS OF DETECTION AND EARLY TREATMENT

*Men Ages 65 to 75 Years Who Have Ever Smoked.* Four large, population-based, randomized, controlled trials (RCTs) show that invitation to one-time screening for AAA is associated with reduced AAA-specific mortality in men. This benefit begins 3 years after testing and persists up to 15 years.[1,2] In addition, risk reduction for AAA rupture and emergency surgery persists up to 10 to 13 years.[1,2]

In the two highest-quality trials, the relative reduction in AAA-specific mortality after 13 years was 42% to 66%.[3,4] In the largest trial, where prevalence of AAA was approximately 5% in the screened group, screening was associated with an absolute risk reduction in AAA death of 1.4 per 1,000 men.[3]

Abdominal aortic aneurysms are most prevalent in men who have ever smoked, occurring in approximately 6% to 7% of this population.[5,6] This prevalence increases the importance of screening in these men because it maximizes the absolute benefit that could be achieved (that is, it improves

the likelihood that men in this group will benefit from screening). Convincing evidence shows that one-time screening for AAA with ultrasonography results in a moderate benefit in men ages 65 to 75 years who have ever smoked.

*Men Ages 65 to 75 Years Who Have Never Smoked.* Screening men overall reduces AAA-specific death, rupture, and emergency surgery. However, the lower prevalence of AAA in men who have never smoked (approximately 2%)[5] substantially reduces the absolute benefit (that is, it greatly lowers the probability that men in this group will benefit from screening). Adequate evidence shows that one-time screening for AAA with ultrasonography results in a small benefit in men ages 65 to 75 years who have never smoked.

*Women Ages 65 to 75 Years Who Have Ever Smoked.* Only one RCT on screening for AAA included women.[7] It detected no difference in the rate of AAA rupture, AAA-specific mortality, or all-cause mortality between women invited for screening and the control group.[8] However, the trial was ultimately underpowered to detect differences in health outcomes by sex; as such, the

**Table 1. Screening for Abdominal Aortic Aneurysm: Clinical Summary of the USPSTF Recommendation**

| Population | Men ages 65 to 75 years who have ever smoked* | Men ages 65 to 75 years who have never smoked | Women ages 65 to 75 years who have ever smoked | Women who have never smoked |
|---|---|---|---|---|
| Recommendation | Screen once for abdominal aortic aneurysm (AAA) by ultrasonography.<br>Grade: B | Selectively screen for AAA.<br>Grade: C | No recommendation.<br>Grade: I statement | Do not screen for AAA.<br>Grade: D |
| Risk assessment | Risk factors for AAA include older age; a positive smoking history; having a first-degree relative with an AAA; and having a history of other vascular aneurysms, coronary artery disease, cerebrovascular disease, atherosclerosis, hypercholesterolemia, obesity, or hypertension.<br>Factors associated with a reduced risk for AAA include African American race, Hispanic ethnicity, and diabetes. | | | |
| Screening tests | Abdominal duplex ultrasonography is the standard approach for AAA screening. Screening with ultrasonography is noninvasive and easy to perform and has high sensitivity (94% to 100%) and specificity (98% to 100%) for detection. | | | |
| Treatment | Patients with large AAAs (≥ 5.5 cm) are referred for open surgical repair or endovascular aneurysm repair. Patients with smaller aneurysms (3.0 to 5.4 cm) are generally managed conservatively via surveillance (e.g., repeated ultrasonography every 3 to 12 months). Early open surgery for the treatment of smaller AAAs does not reduce AAA-specific or all-cause mortality. Surgical referral of smaller AAAs is typically reserved for rapid growth (> 1.0 cm per year) or once the threshold of ≥ 5.5 cm on repeated ultrasonography is reached.<br>Short-term treatment with antibiotics or β-blockers does not appear to reduce AAA growth. | | | |
| Balance of benefits and harms | There is a moderate net benefit of screening for AAA with ultrasonography in men ages 65 to 75 years who have ever smoked. | There is a small net benefit of screening for AAA with ultrasonography in men ages 65 to 75 years who have never smoked. | The evidence of screening for AAA in women ages 65 to 75 years who have ever smoked is insufficient, and the balance of benefits and harms cannot be determined. | The harms of screening for AAA in women who have never smoked outweigh any potential benefits. |

NOTE: *For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, go to http://www.uspreventiveservicestaskforce.org/.*

*USPSTF = U.S. Preventive Services Task Force.*

**—"Ever smoked" is defined as a person who has smoked at least 100 cigarettes in his or her lifetime.*

results do not rule out the possibility of a small benefit of screening in this population.

Women age 70 years who have ever smoked have a relatively low prevalence of AAA (approximately 0.8% overall and approximately 2.0% for current smokers).[9] Evidence is inadequate to conclude whether one-time screening for AAA with ultrasonography is beneficial in women ages 65 to 75 years who have ever smoked.

*Women Who Have Never Smoked.* The prevalence of AAA in women who have never smoked is low (0.03% to 0.60% in women ages 50 to 79 years).[5,9] The evidence also shows no apparent benefit of screening for AAA in women.[8] The USPSTF therefore concludes that adequate evidence shows that the absolute benefit of one-time screening for AAA with ultrasonography in women who have never smoked can effectively be bounded at none or almost none.

#### HARMS OF DETECTION AND EARLY TREATMENT

In the available trials, groups invited to screening were approximately twice as likely as control groups to have any AAA surgery within 3 to 5 years, predominantly driven by an increase in elective surgeries. More than 90% of AAAs identified by screening were below the 5.5-cm threshold for immediate repair. Detecting smaller AAAs generally leads to long-term (potentially lifelong) surveillance.[1,2]

A person's risk for death related to elective surgery for AAA is lower than that for death related to emergency surgery for AAA rupture. However, the increase in the overall rates of detection and surgery in the screening groups still potentially represents a harm. A proportion of AAAs will never rupture because they do not advance to conditions for the rupture to appear or because a person dies of a competing cause.

The exact extent of overdiagnosis and overtreatment is difficult to estimate. One study from Massachusetts General Hospital reviewed 24,000 consecutive autopsies between 1952 and 1975 and found that 75% of the 473 patients who died with an undetected or unoperated AAA had a cause of death not related to the AAA (41% of AAAs were > 5.1 cm in diameter).[10] Given that even elective treatment of AAA is associated with some risk for perioperative mortality, overtreatment is an important issue to consider when deciding whether to screen for this condition.

One study reported that women had a higher risk for death related to AAA surgery than men; death rates of women and men were approximately 7% versus 5% for open repair and 2% versus 1% for endovascular repair, respectively.[11] Evidence is limited and conflicting about the effect of screening for AAA on quality of life or psychological status (for example, anxiety).[1,2] Convincing evidence shows that the harms associated with one-time screening for AAA with ultrasonography are at least small in all populations and potentially higher in women because of their higher risk for operative mortality.

#### USPSTF ASSESSMENT

The USPSTF concludes with high certainty that screening for AAA with ultrasonography in men ages 65 to 75 years who have ever smoked has a moderate net benefit.

The USPSTF concludes with moderate certainty that screening for AAA with ultrasonography in men ages 65 to 75 years who have never smoked has a small net benefit.

The USPSTF concludes that the evidence is insufficient to determine the balance of benefits and harms of screening for AAA in women ages 65 to 75 years who have ever smoked.

The USPSTF concludes with moderate certainty that the harms of screening for AAA outweigh any potential benefits in women who have never smoked.

## Clinical Considerations

#### PATIENT POPULATION UNDER CONSIDERATION

This recommendation applies to asymptomatic adults age 50 years or older.

#### ASSESSMENT OF RISK

*Smoking Status.* Consuming 100 or more cigarettes is commonly used in epidemiologic literature to define an "ever-smoker." However, the randomized trials of screening for AAA did not gather specific data about participants' smoking histories. Occasional tobacco use for a short time in the past (for

example, occasional "social" smoking as an adolescent or young adult) is unlikely to have a pronounced biological effect, and the odds ratio (OR) of developing a large (≥ 5.0 cm) AAA is actually less than 1.0 for prior smokers who have quit for at least 10 years.[12] However, observational studies have found that even a relatively modest smoking history (for example, smoking a half-pack or less per day for fewer than 10 years) does increase the likelihood of developing a large AAA.[12]

*Screening in Men Ages 65 to 75 Years Who Have Never Smoked.* Despite the demonstrated benefits of screening for AAA in men overall, the lower prevalence of AAA in male never-smokers versus male ever-smokers suggests that clinicians should consider a patient's risk factors and the potential for harm before screening for AAA rather than routinely offering screening to all male never-smokers. Important risk factors for AAA include older age and a first-degree relative with an AAA; other risk factors include a history of other vascular aneurysms, coronary artery disease, cerebrovascular disease, atherosclerosis, hypercholesterolemia, obesity, and hypertension. Factors associated with a reduced risk for AAA include African American race, Hispanic ethnicity, and diabetes.[5,12,13]

## SUGGESTIONS FOR PRACTICE REGARDING THE I STATEMENT

### *Screening in Women Ages 65 to 75 Years Who Have Ever Smoked*

*Potential Preventable Burden.* A screening study in Sweden found that the prevalence of AAA in women age 70 years was low (0.8%) for ever-smokers but increased to 2.0% for current smokers.[9] A meta-analysis of individual-patient data found that women have a higher risk than men for AAA rupture at the same diameter (hazard ratio [HR], 3.76 [95% CI, 2.58 to 5.47]).[14] However, AAA-associated deaths occur at an older age in women (at a time of increased competing causes of death and a declining benefit–risk ratio for operative interventions), with 70% of deaths occurring after age 80 years in women compared with fewer than 50% in men.[1,2] In the only screening RCT that included women, most screen-detected AAAs in women were small (3.0 to 3.9 cm) and AAA-specific mortality was low in screened and unscreened women (< 0.2%) after 10 years.[8]

*Potential Harms.* Four RCTs (primarily done in men) showed that screening for AAA doubled the rate of AAA-associated surgeries, largely driven by an increase in elective surgeries. Most screen-detected AAAs were below the 5.5-cm threshold for immediate repair. This finding generally results in long-term or lifelong surveillance and is probably associated with some amount of overtreatment, although the magnitude of this burden is difficult to quantify.

Most screening trials reported an associated decrease in emergency AAA repairs and a reduced 30-day mortality rate associated with emergency surgery in populations invited to screen, although mortality associated with elective surgery was not reduced.[1,2] Operative mortality associated with AAAs is higher in women than in men (7% vs. 5% for open repair and 2% vs. 1% for endovascular repair, respectively).[11]

*Costs.* In addition to the cost of ultrasonography screening (approximately $100),[15] the estimated potential associated cost of elective surgery to repair a screen-detected AAA ranges from $37,000 to $43,000.[16] Potential opportunity costs also may arise, because screening may take the place of other preventive activities that may be of greater benefit to the patient.

*Current Practice.* Screening for AAA is provided as part of the "welcome-to-Medicare visit" for women who have a family history of AAA.[17] However, the evidence is insufficient to accurately characterize current practice patterns related to screening for AAA in women.

A retrospective analysis from 2000 to 2010 used the National Inpatient Sample, a database that has a stratified 20% random sample of all nonfederal inpatient hospital admissions in the United States. This analysis found that women are more likely than men to have open surgery versus endovascular aneurysm repair (EVAR) for unruptured AAA (24% vs. 17%, respectively), potentially because of issues with access to the iliac artery (that is, smaller artery size) that may preclude endovascular management.[18]

A retrospective review of 4,026 AAA repairs in the Vascular Study Group of New

England database (a voluntary registry from 30 academic and community hospitals in six New England states) reported that women were more likely than men to have open surgery versus EVAR and to be older and have smaller aortic diameters at the time of repair. Postoperative complications were higher in women than in men after elective EVAR or open repair, including emergency reoperations, dysrhythmias, leg ischemia or emboli, bowel ischemia, or need for discharge to another medical facility rather than home.[19]

### SCREENING METHODS

Conventional abdominal duplex ultrasonography was the primary method used in the available trials of AAA screening. Primary care physicians and vascular surgeons widely accept abdominal duplex ultrasonography as the standard approach. Screening with ultrasonography is noninvasive and easy to do and has high sensitivity (94% to 100%) and specificity (98% to 100%) for detecting AAA.[1,2] In addition, it has shown high rates of reproducibility, does not expose patients to radiation, and is relatively low-cost.

The use of handheld, portable ultrasonography devices in clinician office settings has been proposed as an alternative approach to conventional abdominal duplex ultrasonography done in the radiology setting. Several small observational studies suggest that in-office handheld ultrasonography has reasonable sensitivity and specificity for AAA detection compared with conventional ultrasonography. However, it has not been formally evaluated in a clinical trial.[20,21]

### SCREENING INTERVALS

Evidence is adequate to support one-time screening in men who have ever smoked. All of the population-based RCTs of AAA screening used a one-time screening approach, and several fair- to good-quality prospective cohort studies show that AAA-associated mortality over 5 to 12 years is low (0.0% to 2.4%) in men with initially normal results on ultrasonography.[1,2]

### TREATMENT

In the available screening trials, immediate referral for open surgery in patients with large AAAs (≥ 5.5 cm) and conservative management via repeated ultrasonography every 3 to 12 months for smaller AAAs (3.0 to 5.4 cm) achieved the observed AAA-related mortality benefit. Surgical referral of smaller AAAs was reserved for AAAs that grew rapidly (> 1.0 cm per year) or reached a threshold of 5.5 cm or larger on repeated ultrasonography.[1,2]

Although early open surgery for smaller AAAs reduces the risk for rupture compared with surveillance, it does not reduce AAA-specific or all-cause mortality.[22,23] Endovascular aneurysm repair is an alternative to open surgery. As with open surgery, early EVAR did not differ from surveillance for smaller AAAs in all-cause or AAA-related mortality in randomized trials that evaluated these interventions. Unlike early open surgery, early EVAR does not reduce the incidence of AAA rupture.[24,25]

Pharmacotherapy has been proposed to slow the growth of smaller AAAs. Short-term treatment with antibiotics or β-blockers does not seem to reduce AAA growth, and the trials were underpowered to draw conclusions about effects on health outcomes.[1,2]

This recommendation statement was first published in *Ann Intern Med.* 2014;161(4):281-290.

The "Other Considerations," "Discussion," "Response to Public Comments," "Update of Previous USPSTF Recommendation," and "Recommendations of Others" sections of this recommendation statement are available at http://www.uspreventiveservicestaskforce.org/Page/Topic/recommendation-summary/abdominal-aortic-aneurysm-screening.



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